

(HACCP)

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Listeria monocytogenes, *Yersinia enterocolytica*,
Aeromonas hydrophila

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(Bryan, 1988a).

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(Bryan, 1988b).

(fresh-like)

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(Hazard Analysis Critical Control Point,
HACCP)

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(가 가

. HACCP

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(Gould, 1992).

HACCP 7가
(green onion) 가

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(MAP)

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가 , , et al., 1993).

가 1980 가

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가 () 가

가 가 10 가

(Anon, 1988, Scandella & Leteinyurier, 1989, Saracino et al., 1991). (Wilcox et al., 1994).

가 , *Listeria monocytogenes*, *Yersinia enterocolytica*, *Aeromonas hydrophila* (ICMSF, 1988, Berrang et al., 1989, Beuchat & Brackett, 1990, Carlin et al., 1990, Rosset, 1990, Farber, 1991, Schofield, 1992),

(MAP)

(ICMSF, 1988). Abdul- Raouf (1993) MAP

(passive modification) *Escherichia coli* O157:H7 가

(active modification)

가 가

(Carlin et al., 1990, O'Beirne, 1990). (Rhodehamel et al., 1992, Notermans, 1993). MAP

() MAP

(competitive flora) , nonproteolytic *C. botulinum* (Palumbo, Wilcox 1986, Brackett, 1987, Hotchkiss, 1988,

Table 1. Summary chart of the seven HACCP principles (FLAIR, 1994)

- 1 Identify the potential hazard(s), associated with food production at all stages from growth, processing manufacture and distribution until the point of consumption. Assess the likelihood of occurrence of the hazard(s) and identify the preventive measures for their control: Hazard Analysis.
- 2 Determine the points/procedures/operational steps to be controlled to eliminate the hazard or minimize its likelihood of occurrence: identification of Critical Control Points (CCP).
- 3 Establish critical limits which must be met to ensure each CCP is under control.
- 4 Establish a monitoring system to ensure control of the CCP by scheduled testing or observation.
- 5 Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.
- 6 Establish procedures for verification to confirm (by supplementary procedures and tests) that the HACCP system is working effectively.
- 7 Establish a documentation system including all procedures and records appropriate to all the principles and their application.

Hotchkiss & Banco, 1992, Rhodehamel et al., 1992).

nonproteolytic

10 14

(Brown &

(HACCP) . , HACCP

Gould, 1992).

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(*Ascaris* sp.,

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Entamoeba histolytica)

(Hepatitis A

가

. HACCP

1959

Norwalk virus)

Pillsbury

(Brackett, 1987).

(Bauman, 1990).

HACCP

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(NACMCF,

1992).

(*Clostridium*

botulinum, *Salmonella* spp., *Staphylococcus*

aureus), (Hepatitis A, Norwalk virus

L.

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monocytogenes, *Y. enterocolytica*, *A. hydrophila*

(aflatoxins, scrombotoxin)

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3. HACCP

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Table 2. General information and physicochemical characteristics of packaged minimally processed green onion. The worksheet should be dated and signed.

Cut green onion		Date :
		Authorized by :
1. General characteristics		
Composition: green onion		
Volume: 250 g		
Package material: OPP/PE (polypropylene/polyethylene)		
storage conditions on site: maximum 48 h at 4		
2. Physicochemical characteristics		
pH: 5.8 6.2		
water activity: 0.96 0.98		
initial microbial flora:		
Mesophilic aerobic count:	10 ⁵	10 ⁶ cfu/g
Psychrotrophic Gram-negative count:	10 ⁵	10 ⁶ cfu/g
Lactic acid bacteria:	10 ¹	10 ³ cfu/g
3. Details on package		
shelf-life: 14 days		
instructions for storage: keep refrigerated		
instructions for use: wash before consumption		

4 7 Table 3 .
 (Carlin et al., 1990).
 가
 , , 7 (1) (pre-harvest and harvest practices), (2) 가 (production and processing), (3) (distribution and retailing operations), (4) (consumer practice and use) 4 (Anon, 1988, Scandella & Leteinturier, 1989). HACCP
 4.4. 4 : 가 , 가
 HACCP 가 가
 가 , 가
 4.5. 5 : (flow diagram)

Table 3. Flow diagram for minimally processed vegetables from harvest to consumption

1. Pre-harvest practices and harvest (field)
Irrigation and fertilization - harvest
- rinsing cut surface - packing - transport
2. Production and processing
Rapid chilling on receipt - storage
- preparation and selection - cutting - washing
- rinsing - centrifugation - packaging - labelling
- secondary packaging - refrigerated storage
3. Distribution and retailing
Refrigerated transport
- storage in supermarket - display cabinets
4. Consumer practice and use
Transport - storage - consumption

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(NACMCF,

1992).

(critical control points)

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4.6. 6 :

Table 4

HACCP

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4.7. 7 :

4.8. 8 :

(2)

(1)

(CCP)

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L. monocytogenes, *Y. enterocolitica*, *A. hydrophila*

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Table 3

Fig. 1

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(decision tree)

Table 4. Hazards and preventive measures during the pre-harvest and harvest step

Process step	Hazard	Preventive measure(s)
1 Irrigation and fertilization	contamination with pathogens	no sewage and organic fertilizers two weeks before harvest determined in contract with supplier
2 Harvest	contamination	cleaning and disinfection of tools education of personnel in proper harvesting techniques
3 Rinsing cut surface	contamination	use of drinking-water, no reuse of rinsing water

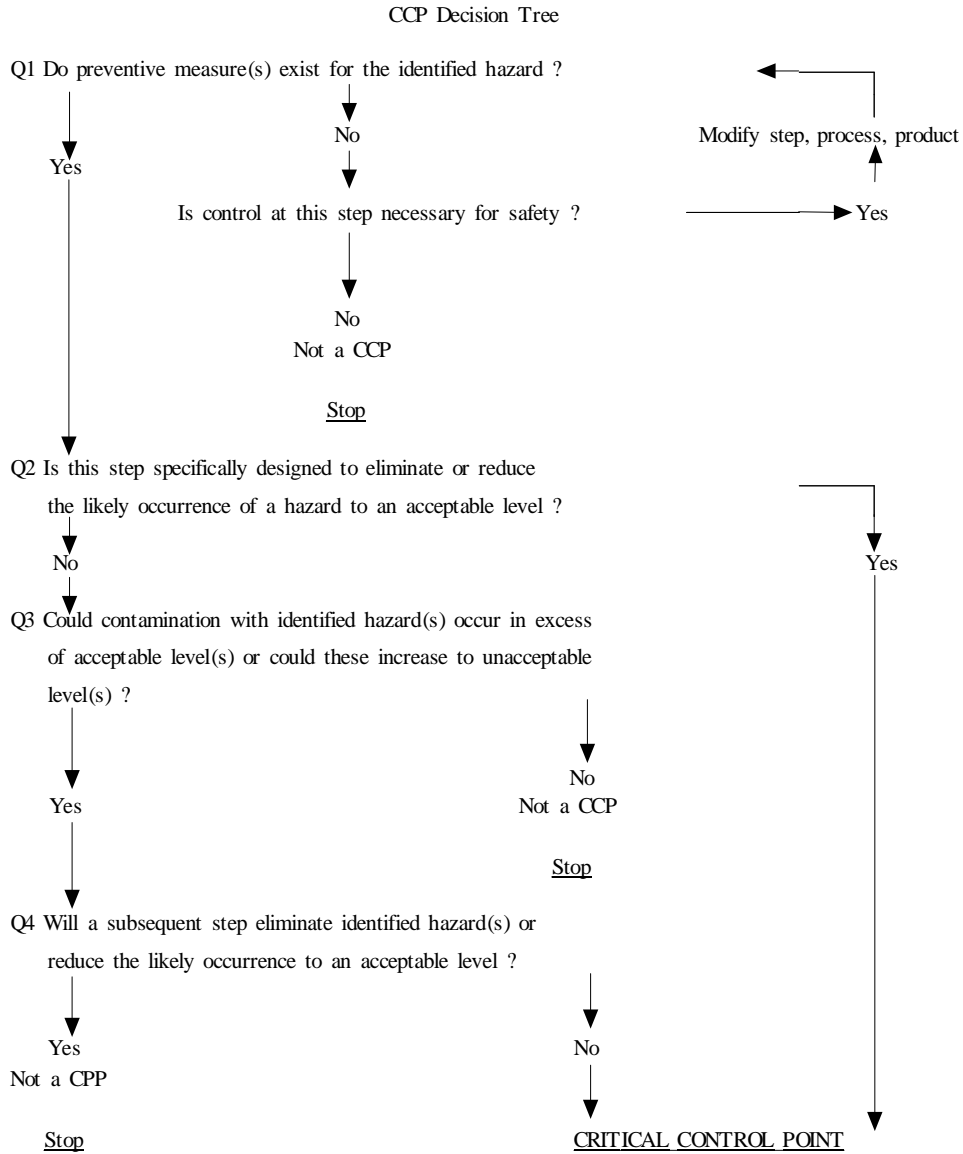


Fig. 1. Decision tree for the determination of the Critical Control Point (CCP). (FLAIR, 1994) Answer each question (Q) in sequence at each step of the process with each identified hazard.

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Table 5

Table 5. Identified hazard, preventive measures and determined CCPs in each step of the production of minimally processed vegetables

Process step	Hazard	Preventive measures	CCP
1 Chilling	pathogene growth	vacuum or cold water cooling, moisturing	CCP 1
2 Storage	growth	temperature control, stock rotation	CCP 2
	contamination	cleaning and disinfection of storage room	CCP 3
3 Preparation	growth	time/temperature control	CCP 4
	contamination	regular waste removal hygiene preparation area good personal hygiene and training	CCP 5
4 Cutting	contamination	cleaning in-place and disinfection	CCP 6
5 Washing	growth	temperature control of wash water chlorination of wash water, no reuse	CCP 7
6 Rinsing	growth	drinking water, no reuse	CCP 8
7 Centrifugation	contamination	cleaning in-place and disinfection control of centrifugation speed and time	CCP 9
8 Packaging	contamination	hygiene of packaging machine integrity test	CCP 10
9 Labelling			
10 Packaging			
11 Storage	growth	temperature control, stock rotation	CCP 11

() (CCP 2) (CCP 11) 가

가 가

가 가 (CCP 4) 가

(CCP 1) 가

(Anon, 1988,

(Hardenburg et al., 1990), Scandella & Leteinturier, 1989). (CCP 5)

((Garg et al 1990),

1.5 5%)

ppm (hypochlorite)
 (Adams et al., 1989),
 (,) 가 가 , , pH,
 (Mazollier, 1988). 가
 (ICMSF,
 1988, Scandella & Leteinturier, 1989).

가 (CCP 8)
 (CCP 9) .
 가 가 (Bolin &
 Huxsoll, 1991),
 , 가
 (CCP 10)
 (CCP 3, CCP 6, (MAP)
 CCP 9). 가
 (Brown & Gould, 1992),
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 가 (Day, 1992). 가
 가
 (CCP 6) (Garg et al.,
 1990).
 , 가 가 (Scandella & Leteinturier, 1989).
 (Brown & Gould, 1992). (CCP
 7) (9). 가 (10),
 (Garg et al., 1990),
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 50 100 HACCP (11).

Table 6. Critical limits, monitoring system and corrective action, established for the CCPs for the hazard of growth of pathogens in the production of minimally processed vegetables

CCP	Critical limits	Monitoring system	Corrective action plan
CCP 1	product center temp. < 4	temperature data logging each batch, two samples	reprocess until product center temperature reach limit
	cooling time < 30 min	automatic registration of fill weight, pressure, and temp. of vacuum chamber or cold water tank	adjust cooling rate of vacuum chamber or cold water
CCP 2 (CCP 11)	product center temp. < 4	air temperature chart recording check product temp. of each shift	adjust air cooling rate
	storage raw materials max. 48 h	labelling (bar code) of raw materials continuous stock monitoring	adjust production scheme place product on hold, investigate, and take appropriate action
CCP 4	air temperature of preparation room < 12	temperature chart recording visual inspection every 2 h	adjust air cooling rate
	residence time of vegetables < 10 min	supervision	adjust line speed
CCP 7	temp. of washing water < 4 water flow rate > 5 l/kg product available chlorine > 100 ppm	continuous temperature monitoring supervision at start of each batch laboratory check on chlorine level	adjust cooling rate of wash water adjust flow rate adjust chlorine dosage
CCP 8	temp. of rinsing water < 4	continuous temperature monitoring	adjust cooling rate of water

4.9. 9 :

(3)

Table 6

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, pH,

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CCP 11

CCP 2

(Anon, 1988).

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4.10. 10 :
(4)

가 (ICMSF, 1988).

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4.11. 11 : (5)

2가 HACCP Table 6

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Table 6

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4.13. 13 : HACCP
(6)

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4.14. 14 : HACCP

(6)

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(HACCP)

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[COM(91)525]

HACCP

(product liability)

HACCP

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