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The World Vegetable Center

35th International Vegetable Training Course
"Vegetables: From Seed to Table and Beyond"
17-21 October 2016

FRESH-CUT VEGETABLES



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Convenience Foods

Food that needs little preparation :
Easy to Cook / Ready to Eat

Shorten the time of meal preparation at home:
Some can eat immediately or after adding water,
heating or thawing: canned, dried, frozen produce and
Fresh-Cut Fruit and Vegetable

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Why Do The People Need Convenience Foods?
(Fresh-Cut Fruit and Vegetables)

- Price Cost reduction
- Health Neutraceutical
- Hygiene Minimize risk and hazard
- Lifestyle Efficiency : We are all busy, we want food on the go
- Choice Exotic fruit and vegetable



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Why do we NEED to do fresh cut?

- Market (Consumers) Need**
 - The haste in daily life
 - Convenience food / easy to cook / easy to eat
 - Too big fruit / Difficult to peel
 - Belief in quality and safety
- Understandard produces (defect, size, color, etc.)**
 - Gain income / Value added
- Reduce garbage transportation**
 - Value added from waste

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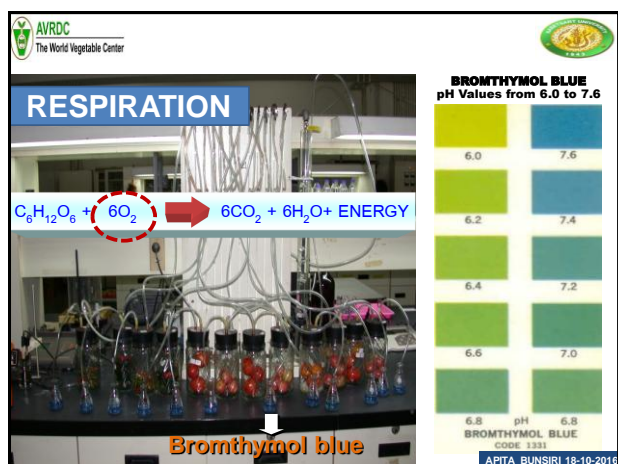
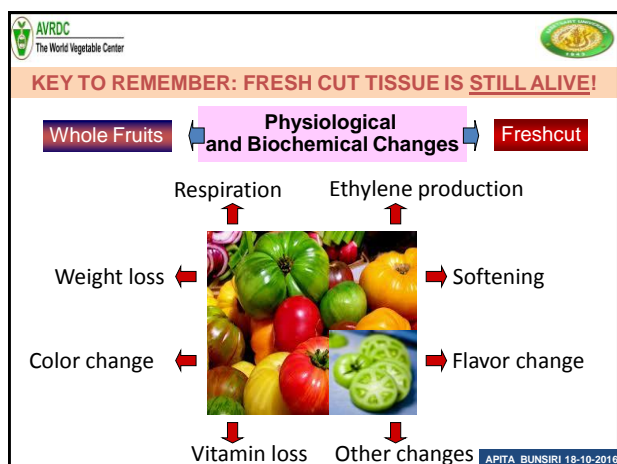
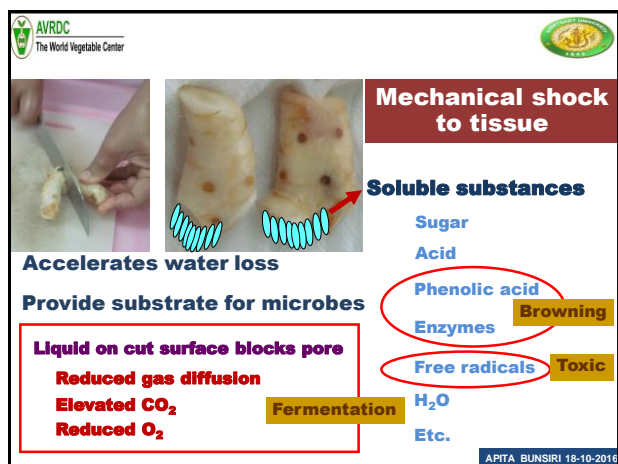
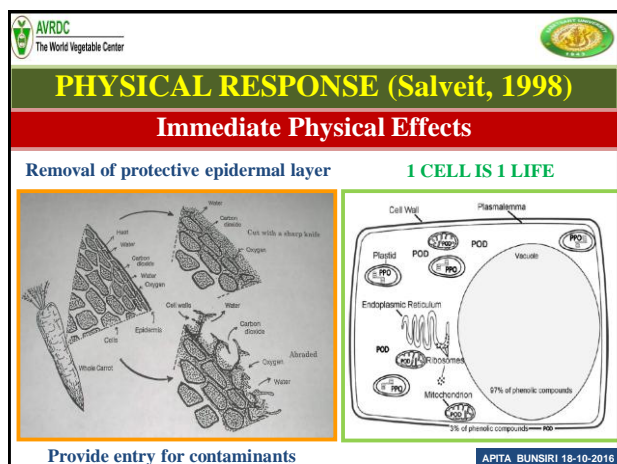
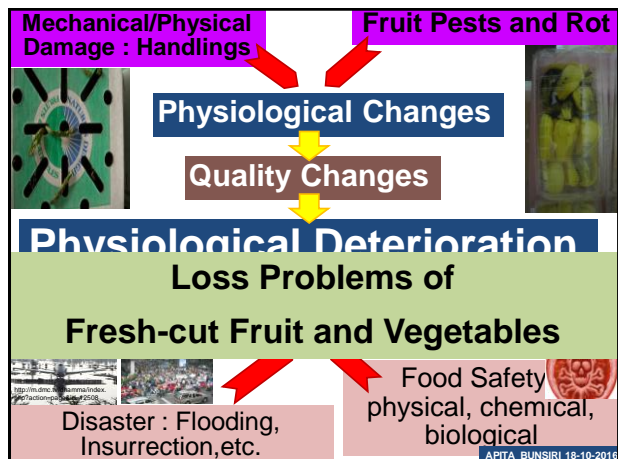
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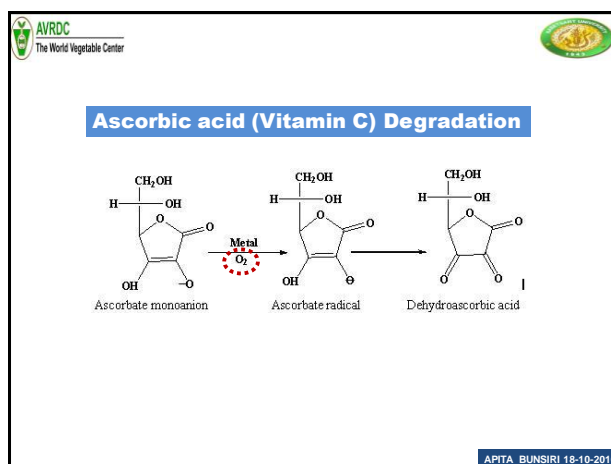
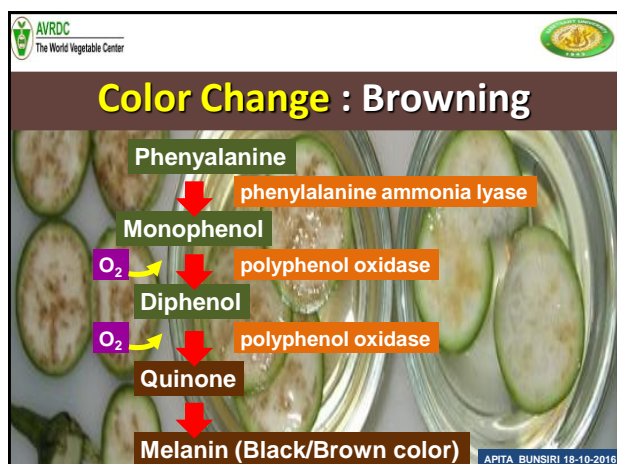
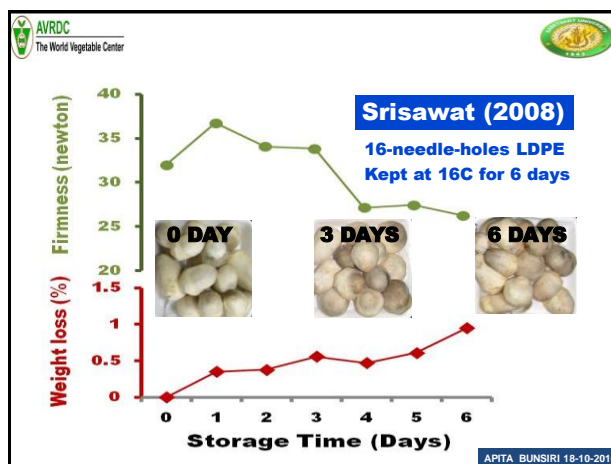
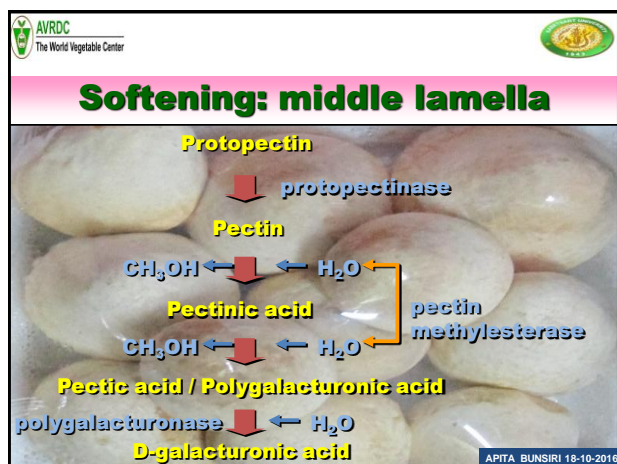
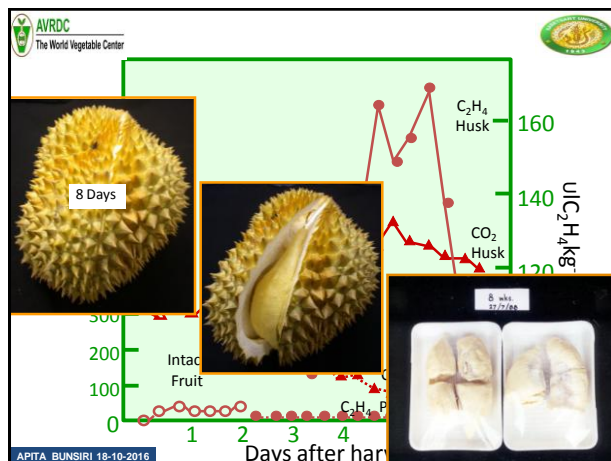
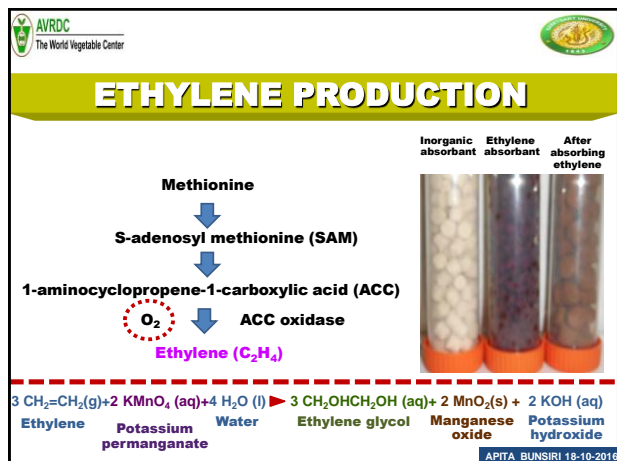
DEFINITION
(IFPA, 2000 ; Watada *et al*, 1996 ; Rolle and Chism,1987)

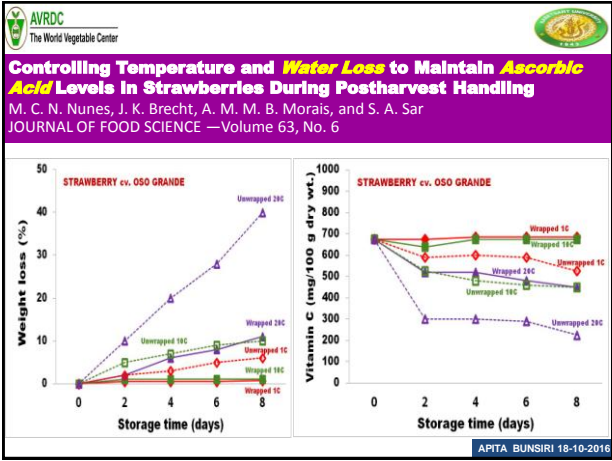
Fresh-cut products :

Fruits or vegetables **intended to be consumed raw** that have been **trimmed, peeled, sliced, shredded, cored and/or cut** into 100% usable product that is subsequently **packaged** to offer consumers high nutrition, conveniences and flavor while **maintaining highly perishable freshness**. **The tissue is still alive!!**

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Foodborne pathogen found on fresh-cut lemongrass

Table 1 *Salmonella* sp., Total plate count, Total coliform, *E. coli* and yeast of fresh-cut lemongrasses dipped in hot water at 52 or 55 °C for 3 or 5 min compared with control (without subjected to warm water) and then stored at 5 °C for 15 days

Trt.	<i>Salmonella</i> sp.	Total plate count	Total coliform	<i>E. coli</i>	Yeast
Established guidelines *	per 25 g	cfu/g	cfu/g	cfu/g	cfu/g
	N.D.	<6x10 ⁵	1x10 ⁵	<20	<1x10 ⁴
Initial microbe	N.D.	8.66x10 ³	19.60	4	10.67
WEEK 2					
Control	N.D.	3.20x10 ³ b	38.67a	0	5.31x10 ³ a
52-3	N.D.	1.14x10 ⁵ a	14.33b	0	1.21x10 ³ b
52-5	N.D.	4.93x10 ⁴ c	14.33b	0	5.22x10 ² c
55-3	N.D.	5.07x10 ⁴ c	2.93c	0	2.52x10 ² c
55-5	N.D.	3.00x10 ⁴ c	3.00c	0	2.64x10 ² c

The established guideline for fresh produce export of Taniyama Siam Co., Ltd. (Rungtani and Bongsiri, 2007)

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Residues (ppm) of pesticides in various portions of unwashed carrots

Portion	Cypermethrin	Diazinon	Parathion
Whole carrot	0.012 (1X)	0.016 (1X)	0.035 (1X)
Crown	0.12 (10X)	0.25 (16X)	0.82 (23X)
Peel	0.021 (1.8X)	0.039 (2.4X)	0.059 (1.7X)
Peeled carrot	nd (0X)	nd (0X)	nd (0X)

Burchat et al., 1998, Food Additives and Contaminants, 15(1):61

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Mechanical/Physical Fruit Pests and Rot Dam

SOME : Can Control

SOME : Out of control

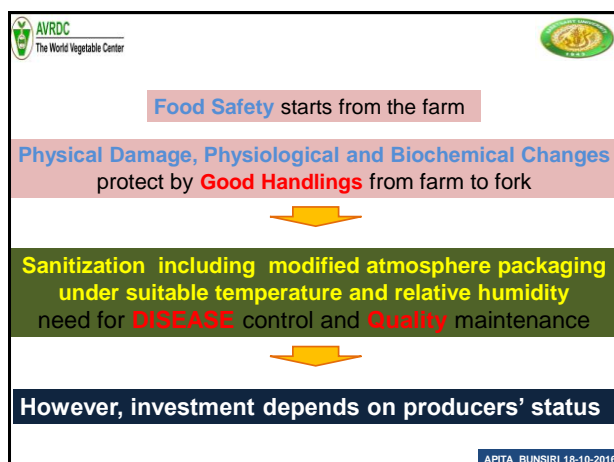
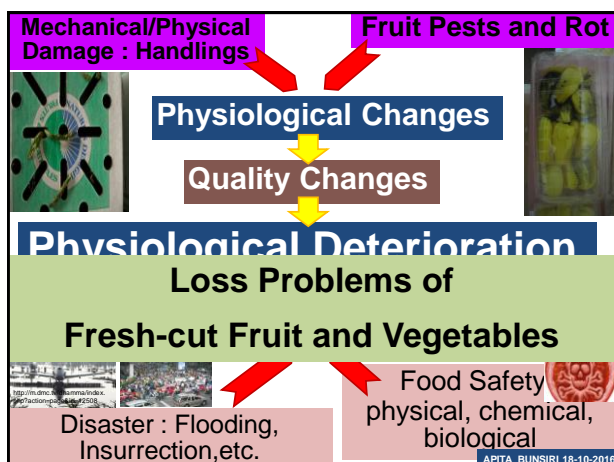
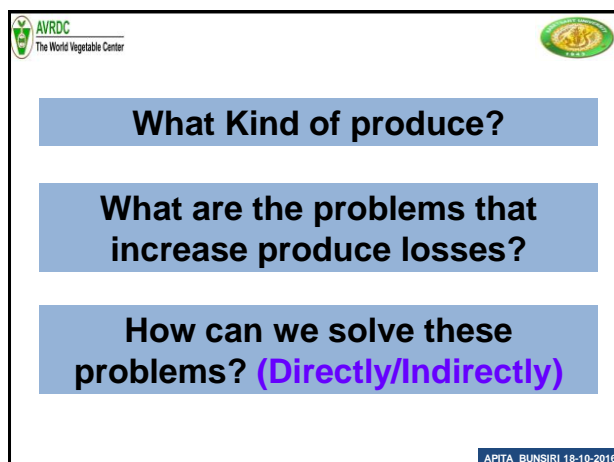
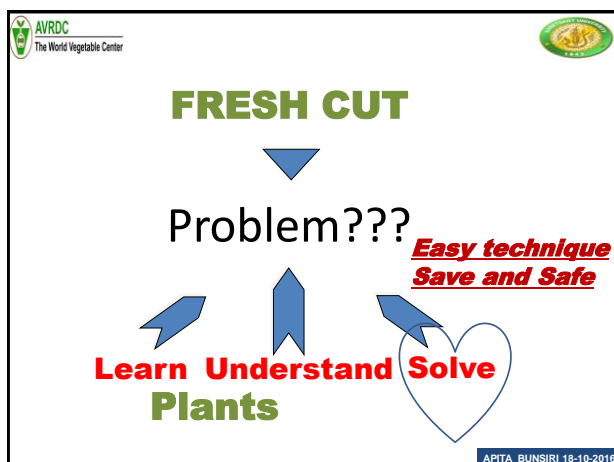
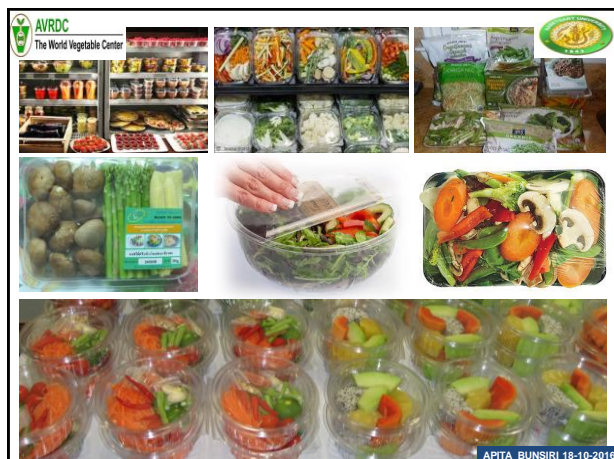
Insurrection, etc.

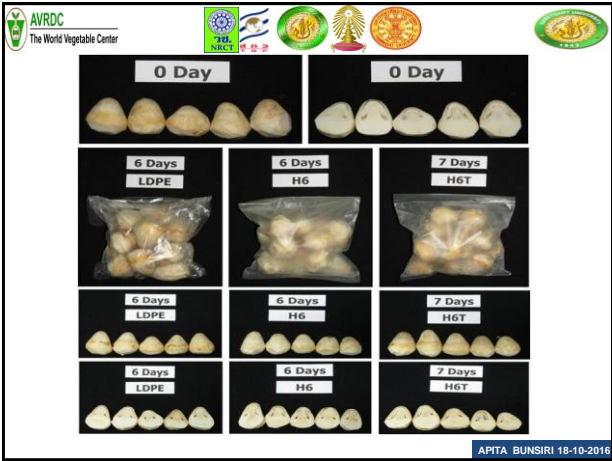
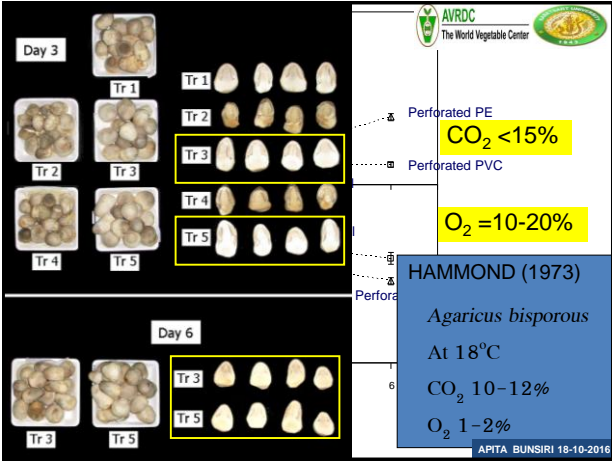
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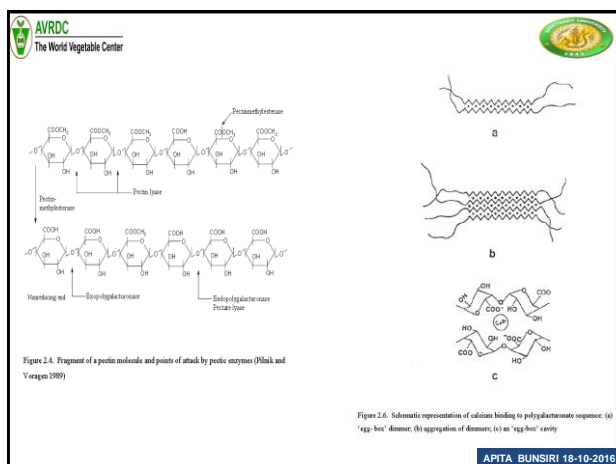
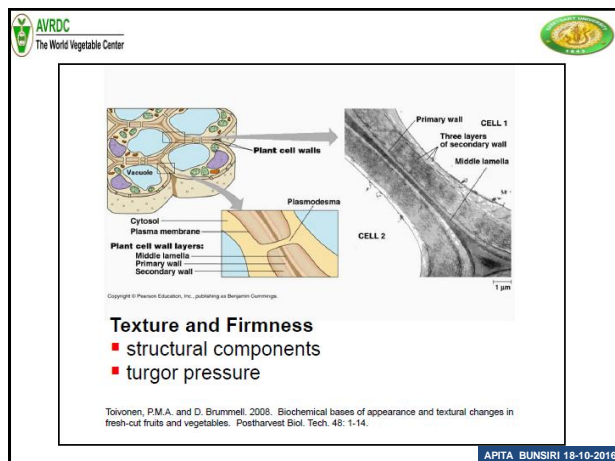
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How to produce Good Convenience Foods (Fresh-cut Fruit and Vegetables)

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Tissue Firmness & Calcium

- ❖ Ca^{2+} stabilizes cell membranes (turgor, membrane permeability and integrity)
- ❖ Ca^{2+} forms ionic bonds between pectin molecules (firmness)

$$\text{---COO}^- \text{Ca}^{2+} \text{---OOC---}$$
- ❖ Ca^{2+} interacts with cell walls & middle lamella: "Egg-box model": Ca^{2+} interacts w/ cell walls & middle lamella

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Browning : Enzyme Activity

monophenol (colorless)

$\text{PPO} + \text{O}_2$

Reducing agents : ascorbic acid and analog, cysteine, glutathione

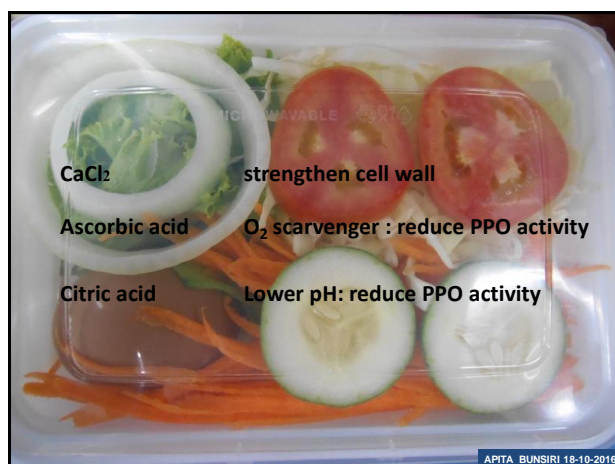
diphenol (colorless) ↔ **o-quinone (color)**

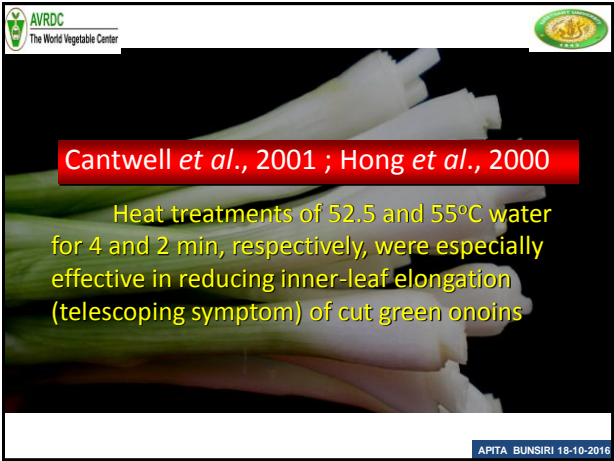
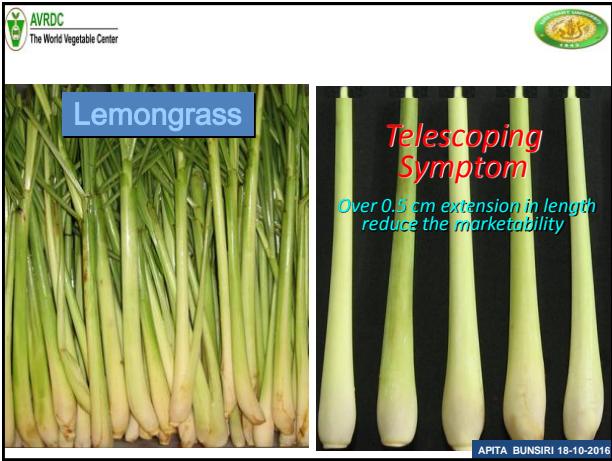
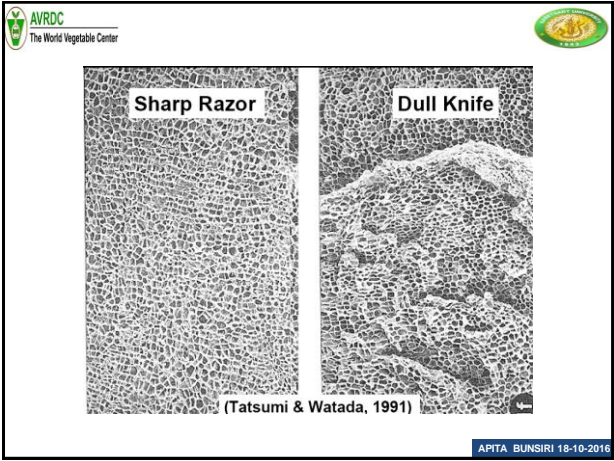
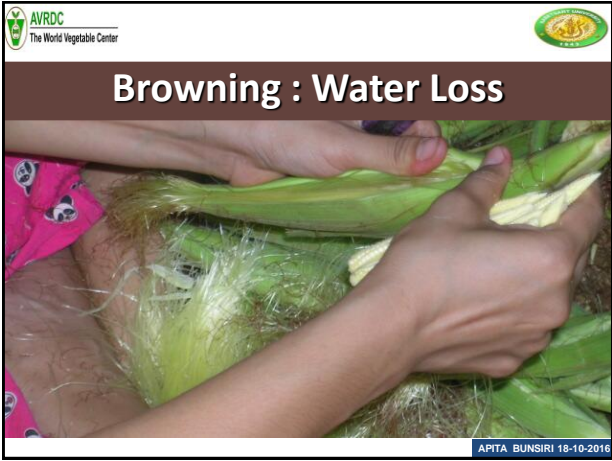
PPO activity $\text{PPO} + \text{O}_2$ amino acids/proteins

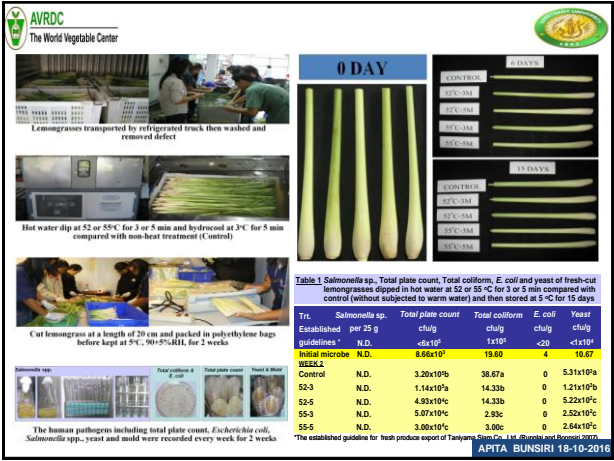
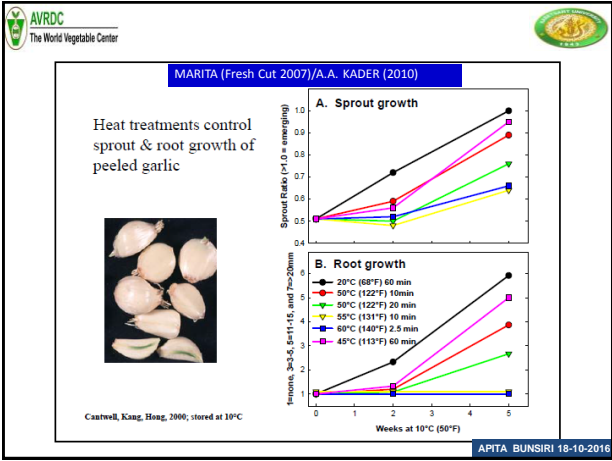
Organic acids/Acidulants/Chelators : citric acid, malic acid, tartaric acid (lowering pH<4)

Complex brown polymers

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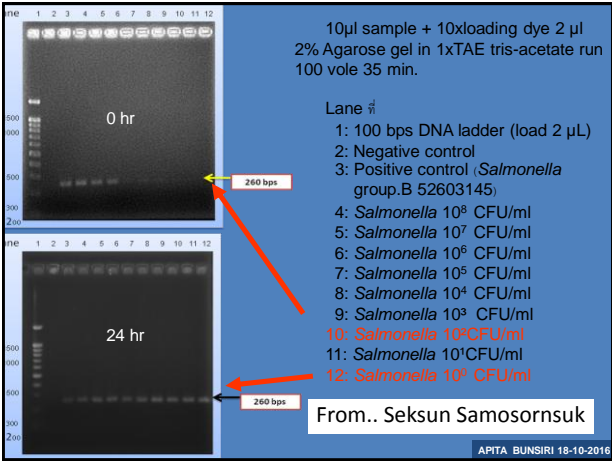




CASE STUDY


Kaffir-Leaves Damage Picture sent back from Moscow, RUSSIA

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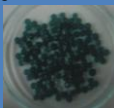
RISK OF MICROBIAL CONTAMINATION

MICROBIAL INDICATOR




Oxalis triangularis

Pigment indicator
pH 4.0-5.0
+
Alginate as absorber




Metabolite :
CO₂, SO₂, NH₄, H₂S,
Organic acid (acetic, lactic) + pH Dye



Guideline : pH ≤ 4.6

Starch and sugar → Lactic acid (pH ≤ 4.6)
Lactobacillus

SAFE **DANGER**




Salmonella spp.
Bacillus cereus
Staphylococcus aureus
Listeria monocytogenes
Escherichia coli O157 H7
Yersinia enterocolitica

http://www.mtec.or.th/index.php?option=com_content&task=view&id=1016&Itemid=176


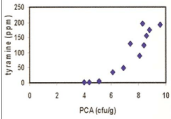
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MICROBIAL INDICATOR


Metabolite :
Alcohol (ethanol) + Enzyme → Substrate + Color Dye
Amine (thiramine)



http://www.tistr-foodprocess.net/download/article/food_safety_issues_th.htm

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Maintain quality & shelf life of fresh product

1. Use highest quality raw material
2. Minimize mechanical damage/sharp knife
3. Rinse cut surface/remove excess water
4. Maintain strict sanitation/chlorinated water
5. Use appropriate package and atmosphere
6. Maintain product quality at 1-5°C

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THANK YOU

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