

# **Kiwi fruit**

## **The power packed fruit**



**Haejin Bae, Noa Nomura & Priyanka Chaudhary.**  
**Texas A & M University**



# Overview

- **What is kiwifruit**
- **Nutrition (phytochemicals)**
- **Agricultural practices (pre and post)**
- **Health and disease (science)**

# Kiwifruit (*Actinidia deliciosa*)

- **Native**

China → New Zealand → Worldwide

- **Description**

Oval, fibrous skin, 2-3" length

- **Cultivars**

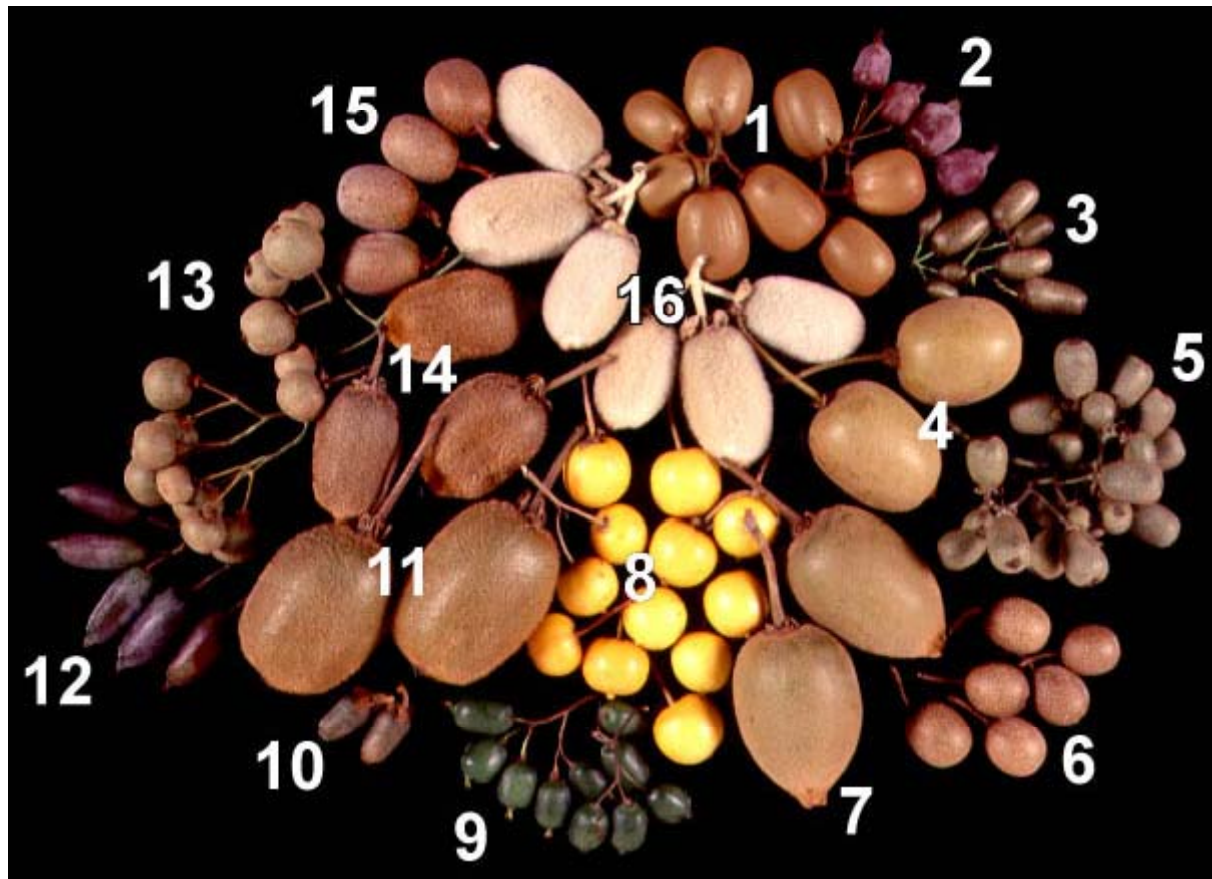
Green, red, & gold kiwifruits

- **Harvest**

Late Oct. ~ early Nov. (Sweetness)

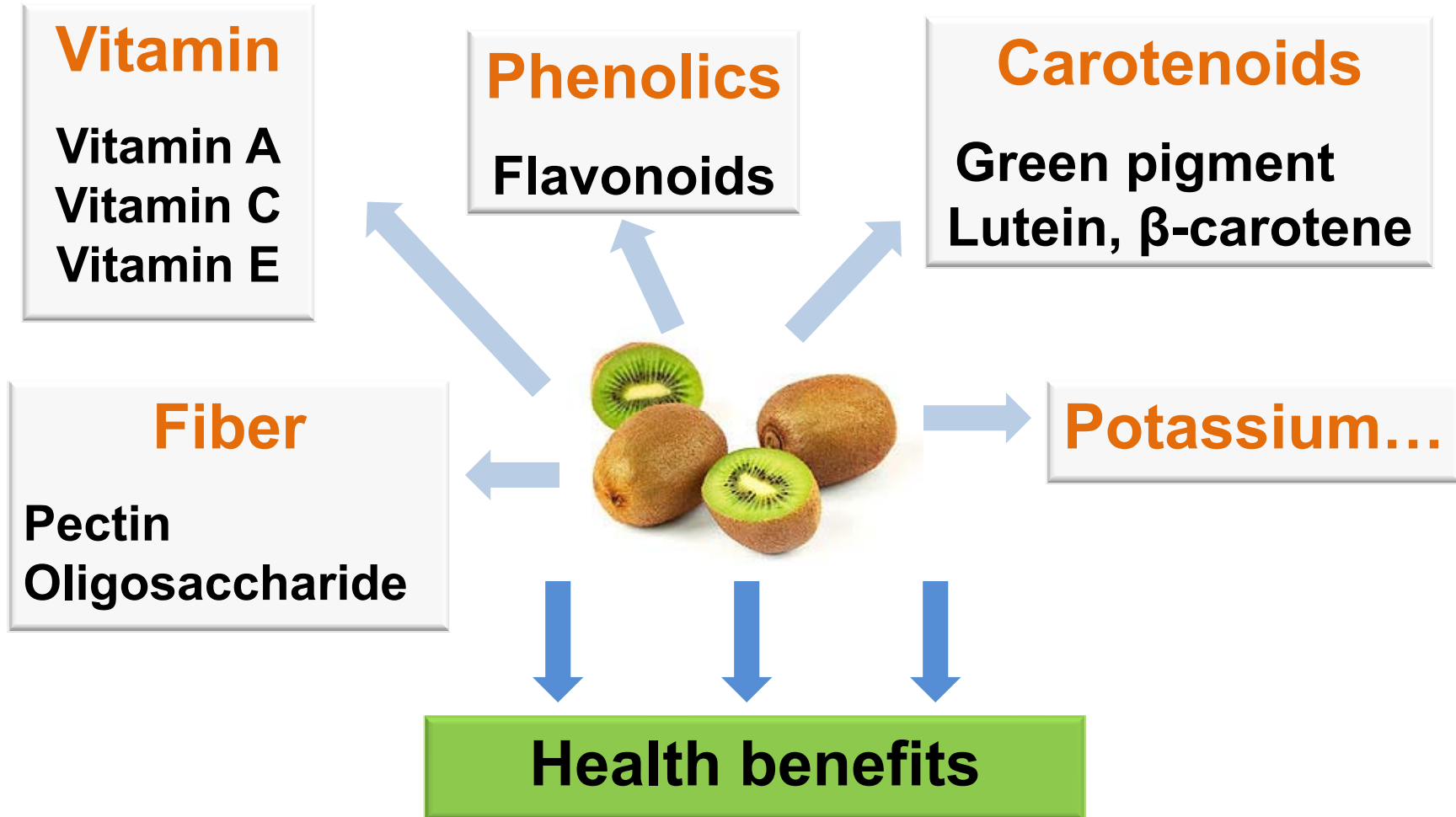


# Fruit Diversity



- 7 - *A. chinensis* 'Hort16A' (Zespri Gold Kiwifruit)  
11 - *A. deliciosa* 'Hayward' (Zespri Green Kiwifruit)

# Nutrition (phytochemical)





# Nutrition

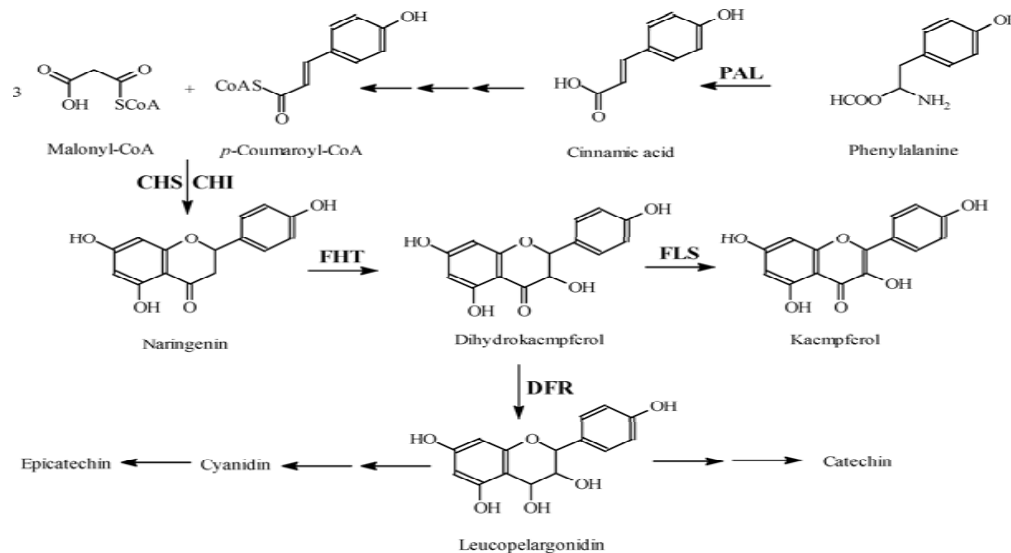
- **Vitamin C (ascorbic acid)**
  - Powerful antioxidant
    - Protect the body against cell damaging of free radicals
    - free radical: increase the risk of cancer
  - Need: 40 mg vit C/ person
    - Kiwifruit: over 50 mg (market fruits)
- **Vitamin E**
  - Fat soluble antioxidant
- **Dietary fiber**
  - Soluble fiber: heart disease, diabetes
  - Insoluble fiber: cancer

# Nutrition



- **Flavonoids (C<sub>6</sub>-C<sub>3</sub>-C<sub>6</sub>)**

- Name is derived from the Latin word *flavus* (yellow color)
- Biological polyphenolic compounds
- Found in leaves, stem, fruits
- Decrease of risk of inflammatory disease & cancer

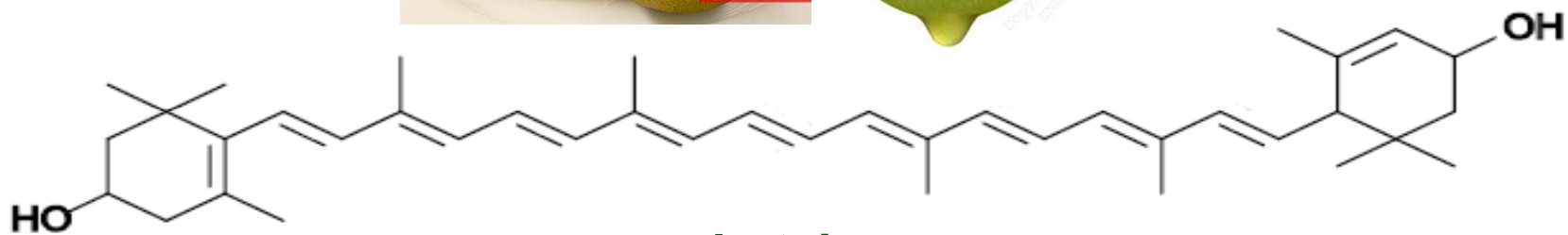
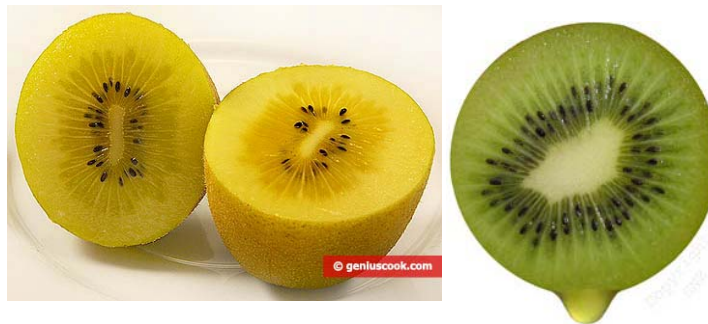




# Nutrition

- **Carotenoids**

- Tetraterpenoids (C<sub>40</sub>): Major phytochemical
- Orange, red, and yellow color pigments
- UV light harvesting, and photo protection
- Lutein,  $\beta$ -carotene, violaxanthin, neoxanthin
- 6.3 ug/ g ripe kiwi fruit



Lutein



# Pre and Post harvest factors



## Pre harvest -

- **Genotype and Cultivars**
- **Canopy position**
- **Maturity and harvest time**



## Post harvest -

- **Storage period and temperature**
- **Gamma irradiation**
- **Post harvest drying**



# Genotype and cultivars

- **Phytochemical content differs in different genotypes and cultivars.**
- **Ascorbic acid higher in *Actinidia chinensis cv chinensis* than *Actinidia deliciosa var Hayward* (Esti et al, 1998)**
- **Comparision study of Hayward, Alison, Abbot, Bruno, Monty cultivars. (Zolfaghari et al, 2008)**
- **Bruno cultivar had highest ascorbic acid content (261.09 mg ), Hayward cultivar had the lowest ascorbic acid content(106.68 mg) per 100g fresh weight**



# Canopy position

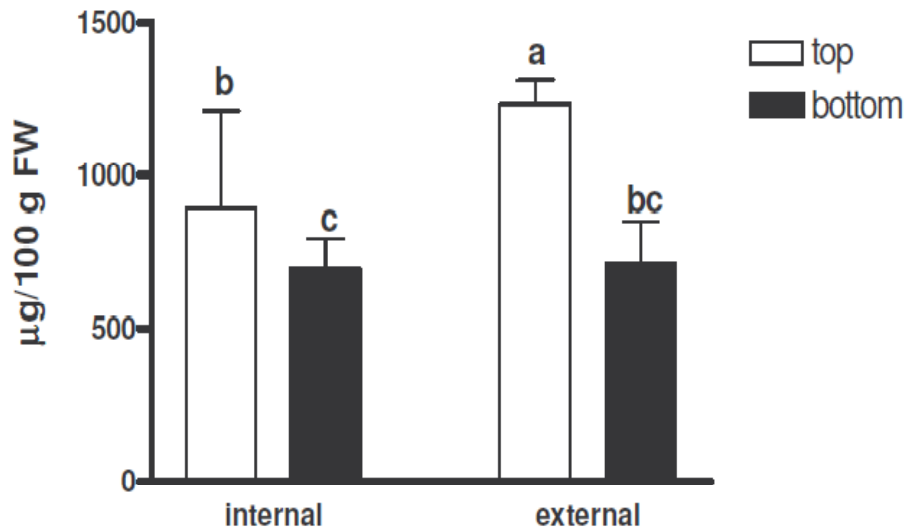
- **Light intensity and fruit position affect ascorbic acid and chlorophyll content.**
- **Increase in photosynthetic sugars increases ascorbic acid content.** (Remorini et al, 2007)



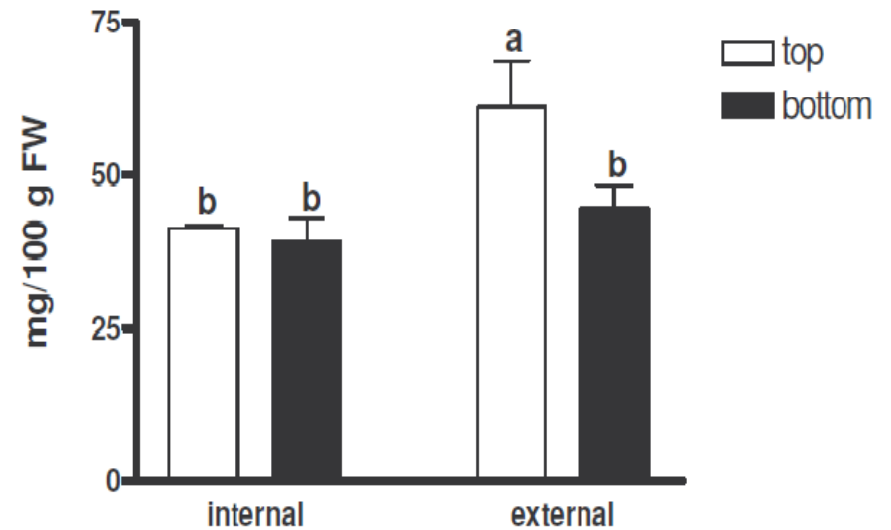
# Canopy position



## Total chlorophyll content



## Ascorbic acid content



(Remorini et al., 2007)



# Maturity and Storage period

## Maturity and harvest time

- Early harvested fruits had more ascorbic acid and carotenoids than late harvested fruits
- No change in antioxidant capacity and phenol content

## Storage period and temperature

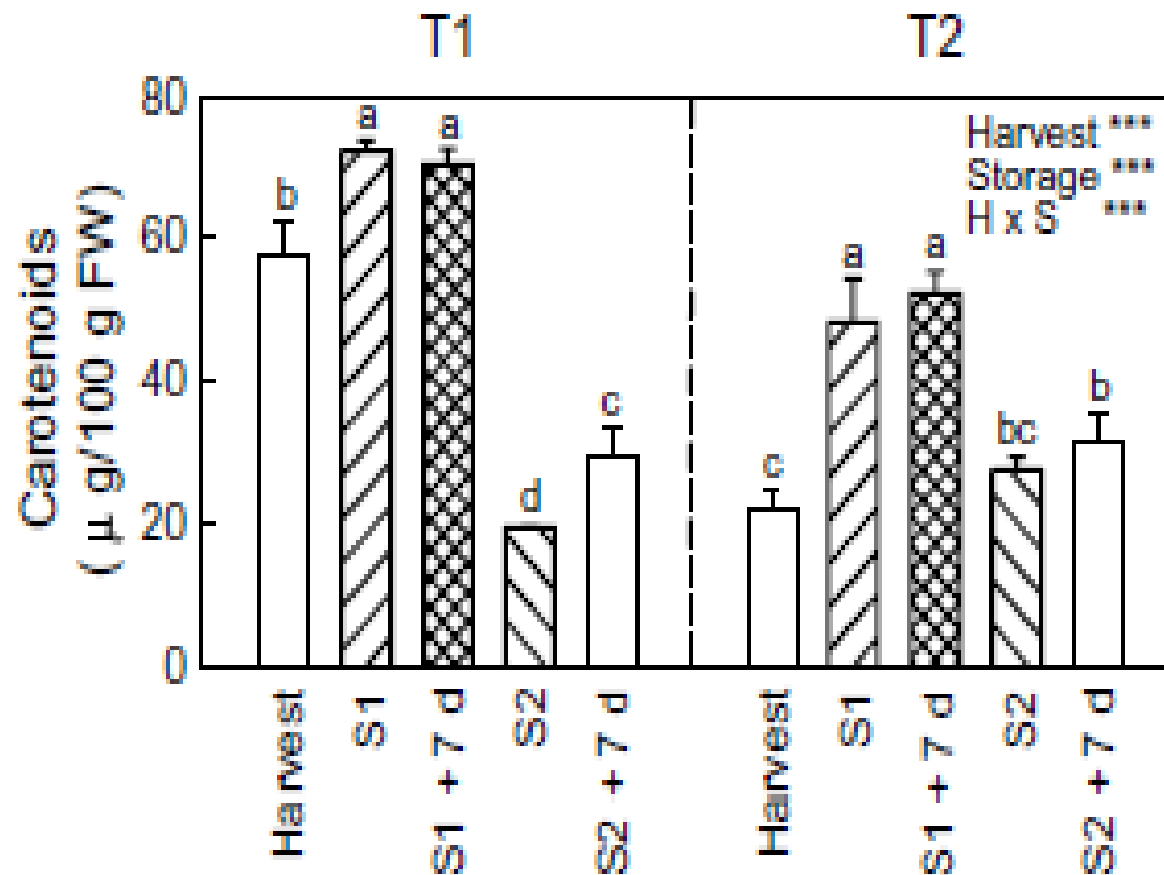
- Storage period and temperature influenced carotenoids, ascorbic acid and antioxidant activity
- Cold storage increased total phenolics – phenol metabolism, increase in PAL (phenylalanine ammonia lyase)





# Maturity and harvest time

## Carotenoids content



(Tavarini et al, 2008)



# Post harvest factors

## Gamma irradiation -

- commonly used to avoid pathogenic microorganism contamination
- detrimental effect on ascorbic acid and antioxidant activity (Kim & Yook, 2009)

## Drying –

- extend shelf life and store the fruits
- Degradation of vitamin C increased with increase of drying air temperature (Kaya et al, 2009)





# Strategies

- **Developing varieties having higher levels of bioactive compounds.**
- **Optimization of cultivation and post harvest practices**
- **Enhancing and maintaining the nutritional value of kiwifruits.**

# Kiwifruit: Health & Disease



- **Packed with a healthy amount of various nutrients**
- **An ideal fruit for better health**



# Health Benefits of Kiwifruit

- **Promotes heart health**
- **Repairs damaged DNA**
- **Relieves wheezing, especially in children**
- **Works as a laxative, especially in older people**



# Heart Health

- **Consumption of 2 kiwifruits each day significantly reduces;**
  - **The amount of fats in the blood**
  - **The formation of blood clots****that can lead to a heart attack or stroke.**

**(Duttaroy, A.K. et al. Platelets. 2004)**



# Heart Health

- **People who ate 2 or 3 kiwifruits every day for a month reduced;**
  - **Their triglycerides by 15 %**
  - **Their risk of a blood clot by 18 %****compared to people who did not eat any kiwifruits.**

**(Duttaroy, A.K. et al. Platelets. 2004)**



# Kiwifruit: DNA Repair

- **Daily kiwifruit consumption, combined with dietary advice and physical activity, promoted a significant increase in repair of damaged DNA.**
- **It is assumed that the antioxidant content of kiwifruit could play a big role in the DNA repair.**

(Collins et al, 2003)



# A Wheezing Suppressant

- **Children eating more kiwifruit and citrus (5~7 times per week) experienced less occurrence of wheezing.**
  - **44 % less occurrence compared to children eating the least kiwifruit and citrus (less than once a week)**

**(Forastiere et al, 2000)**



# A Wheezing Suppressant

- **More kiwifruit and citrus consumption reduced;**
  - **Shortness of breath by 32%**
  - **Severe wheeze by 41%**
  - **Night time cough by 27%**
  - **Chronic cough by 25%**
  - **Runny nose by 28%**

(Forastiere et al, 2000)





# Kiwifruit: A Laxative

- **Kiwifruit has laxative effects due to its high content of dietary fiber. (1.6 % of kiwifruit by weight)**
- **Daily consumption of kiwifruits (1 kiwifruit per 30 kg bodyweight) for 3 weeks improved serious constipation problems, especially in elderly people**

(Rush et al, 2002)



# Laxative & Kiwifruit Fiber

- **Kiwifruit plant cell walls (dietary fiber) swell greatly during fruit ripening.**  
(around 3 ~4 times greater in ripe than in unripe fruit)

**→ Ripe kiwifruit dietary fiber has an exceptionally high water-holding capacity.**  
(an important parameter in faecal bulking & enhancement of laxation)

(Rush et al, 2002)



# Actinidin

- **One of the novel compounds, an enzyme, in kiwifruit**
- **Has been suggested to have the kiwifruit's laxative property**
- **May be one of the most effective allergens in kiwifruit**

(Rush et al, 2002)



# Caution: Kiwifruit Allergy

- **Kiwifruit could be a considerable food allergen that causes severe reactions.**
- **Most likely, severe symptoms (breathing difficulties, wheezing and collapse) occurred in young children with other allergies.**

(Lucas et al, 2004)



# Caution: Allergy

- **The most common symptoms were itching and soreness of the mouth.**
- **The most common severe symptom was wheezing.**
- **64 % of the subjects experienced suffering symptoms within 5 minutes.**

(Lucas et al, 2004)

# How to Eat Kiwifruit





# Conclusion

- **Kiwifruit is the most nutrient dense fruit which we want to eat more frequently, ideally daily, for better health.**
- **Still, be cautious about kiwifruit allergy. (Especially young children and those who have other allergies)**

