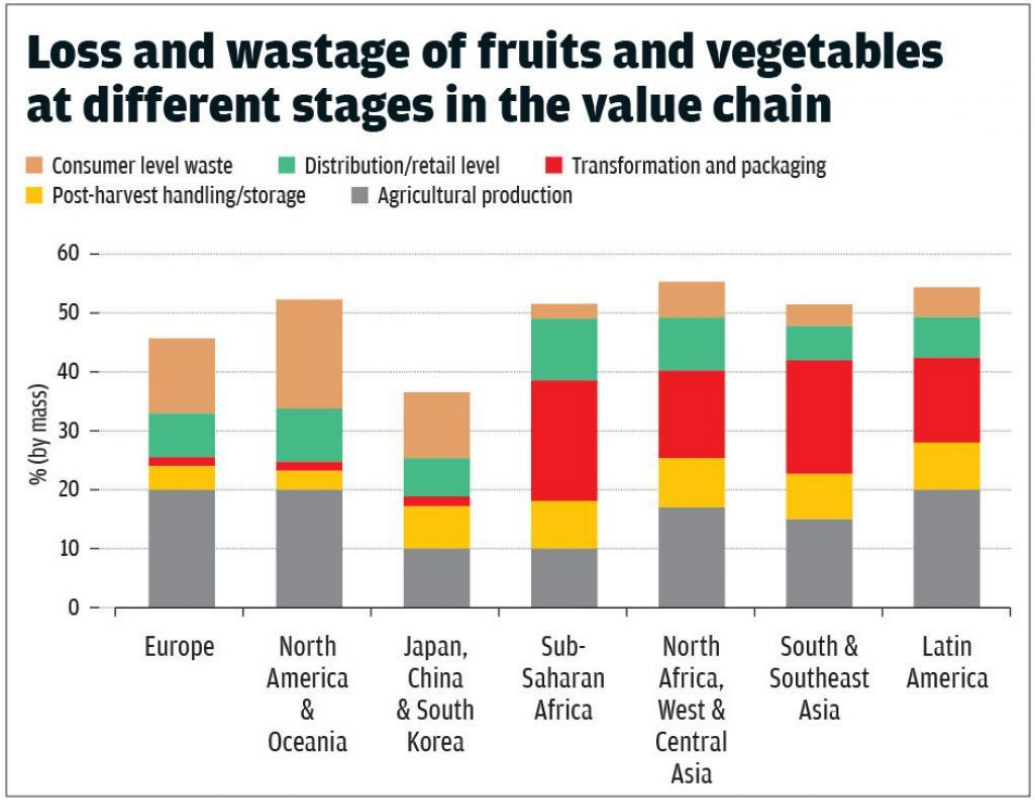
The Impact of Pericarp Structure on Fruit Shelf Life (Eggplants)

Introduction

- Did you know that every year, billions of tons of fruit are wasted due to spoilage?



Source:FAO report 'Global food losses and food waste – Extent, causes and prevention' (2011)

Loss and wastage mainly occurs during postharvest and storage

Fruits and vegetables having the highest percentage at 44%.

Water loss through transpiration is major contributor to decreased shelf-life

- Investigation focused on fruits with intact pericarp vs fruits with pitting on pericarp

Objective

- To determine whether fruits with intact cuticle and transpiration occurring only through the cuticle have a longer shelf life compared to fruits with artificially pricked pericarp.
- To investigate how moisture loss through the pericarp affects the quality and shelf life of fruits

Experimental setup

42 eggplant samples (30 Kaku and 10 Yu in a bag)

- Samples divided into two groups
  - Intact fruits (No. 1-20)
  - Artificially pricked fruits (No. 21-42)

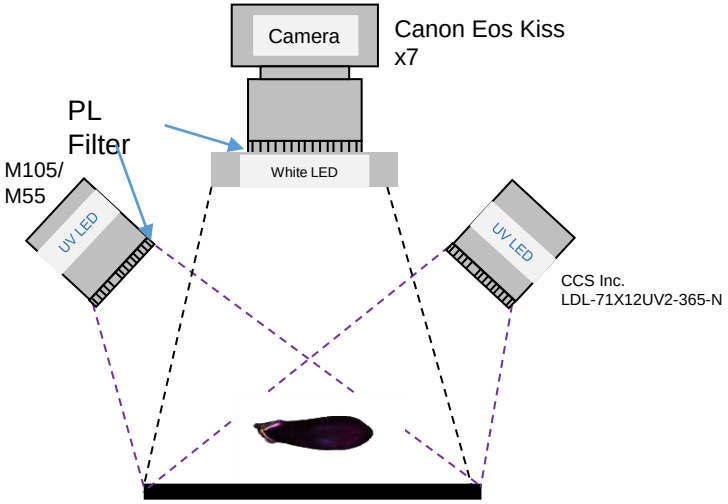
	Intact		Artificial pits	
	A	B	C	D
Sample	No1-10	No11-20	No21-30	No31-42
	10°C	20°C	10°C	20°C

- 5 - 20 pinhole injury (2.5 mm depth) on 20 eggplants (no.21-42).

The effect of ethylene was taken into consideration

Data acquisition

- Image acquisition
  a) Normal color image (storage condition: 10℃ and 20 ℃)
  b) UV induced visible fluorescence (storage condition: 10℃ and 20 ℃)



Weight

Measured from the start date (Feb 22, 2023) and every 3 days until day 16

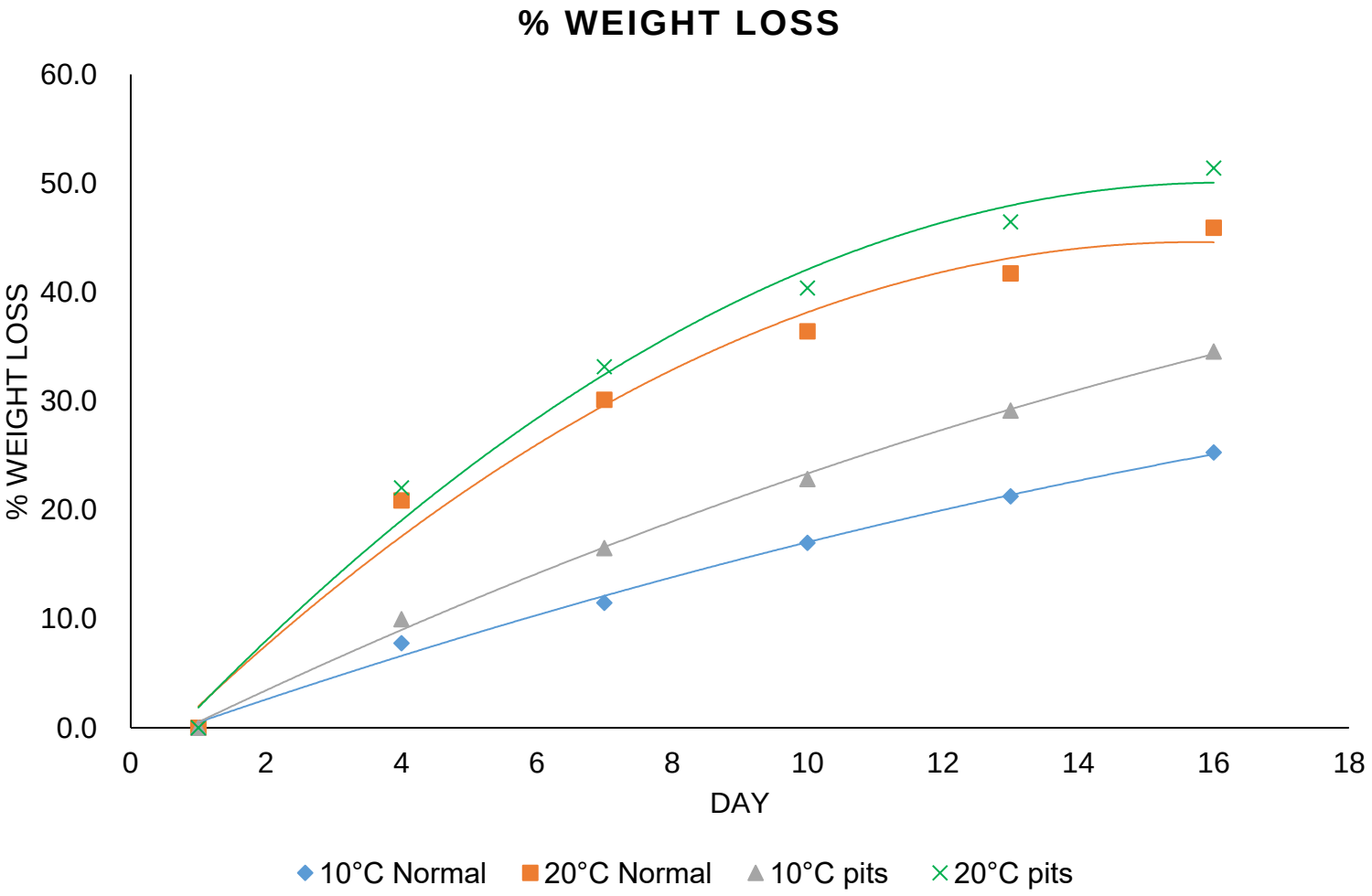
Camera Settings

Parameter	Color Image	FL. Image
Shutter speed	¼ sec	2 sec
F-Number	7.10	7.10
ISO	1600	6400
Focal length	43mm	43mm

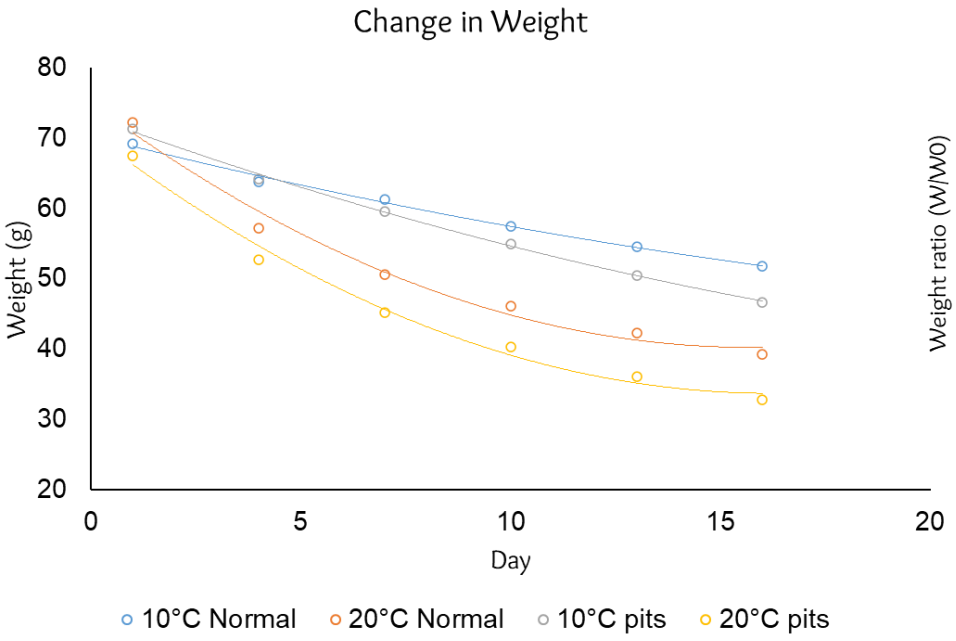
Image was captured four times, at every 90˚ C rotation of the eggplant fruit

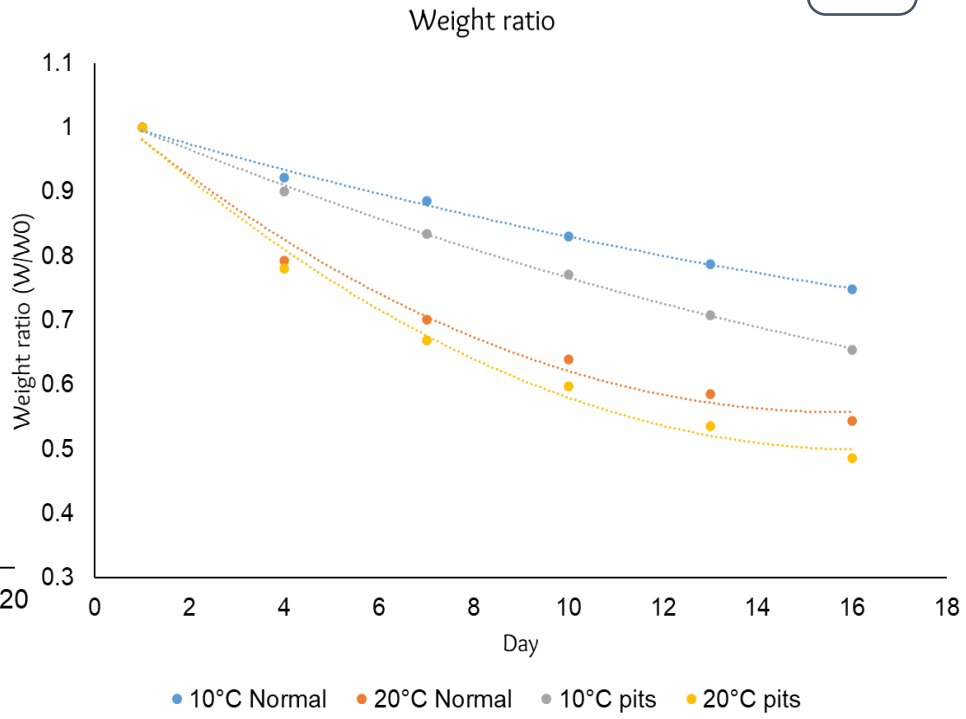
Measurement /Dates	Feb. 22	Feb.25	Feb.28	Mar.3	Mar. 6	Mar. 9
Days after Harvest:	1	4	7	10	13	16

Weight loss


% WEIGHT LOSS
60.0
50.0
40.0
30.0
20.0
10.0
0.0
% WEIGHT LOSS
0
2
4
6
8
10
12
14
16
18
DAY
10°C Normal
20°C Normal
10°C pits
20°C pits

Change in weight and weight ratio

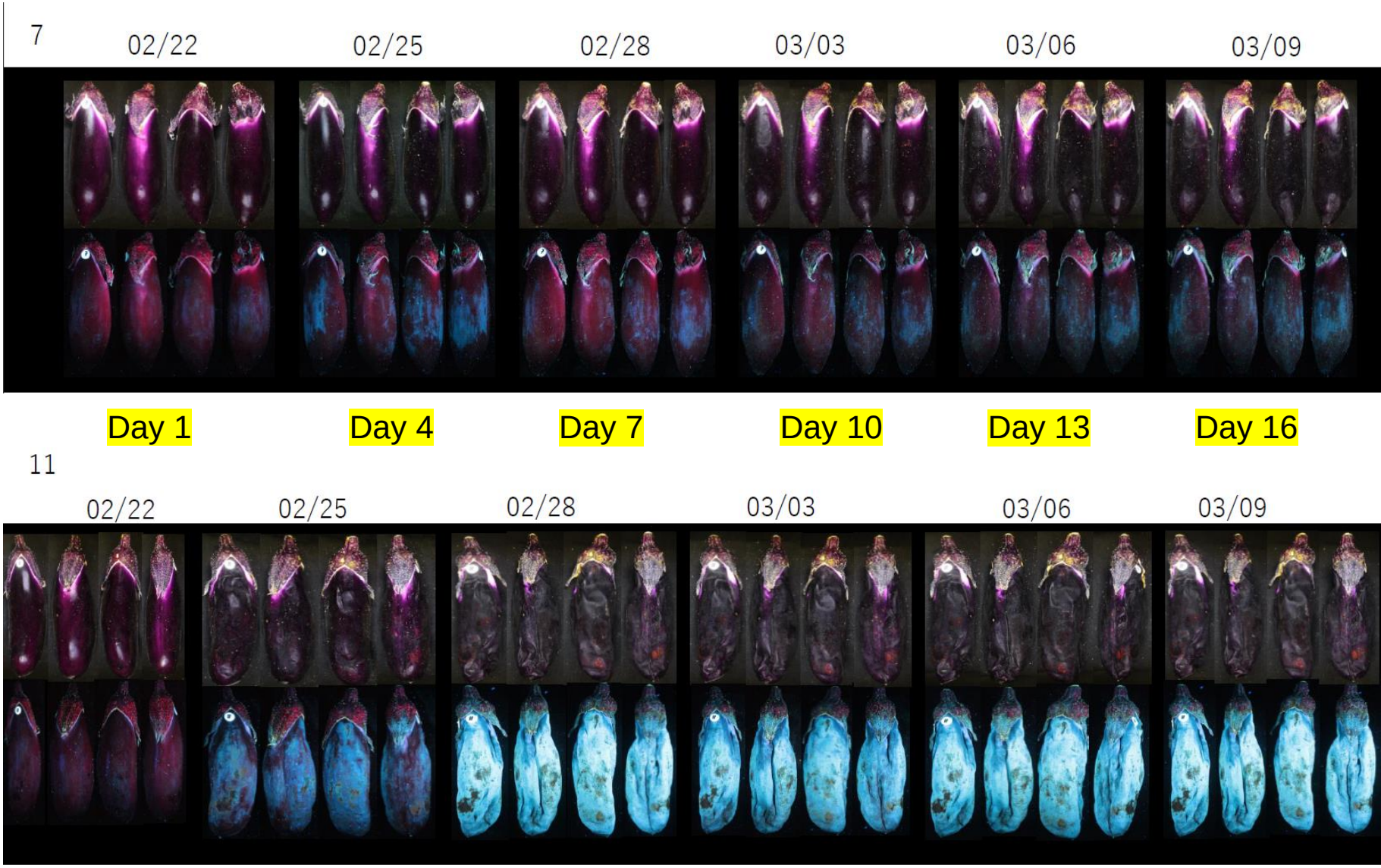




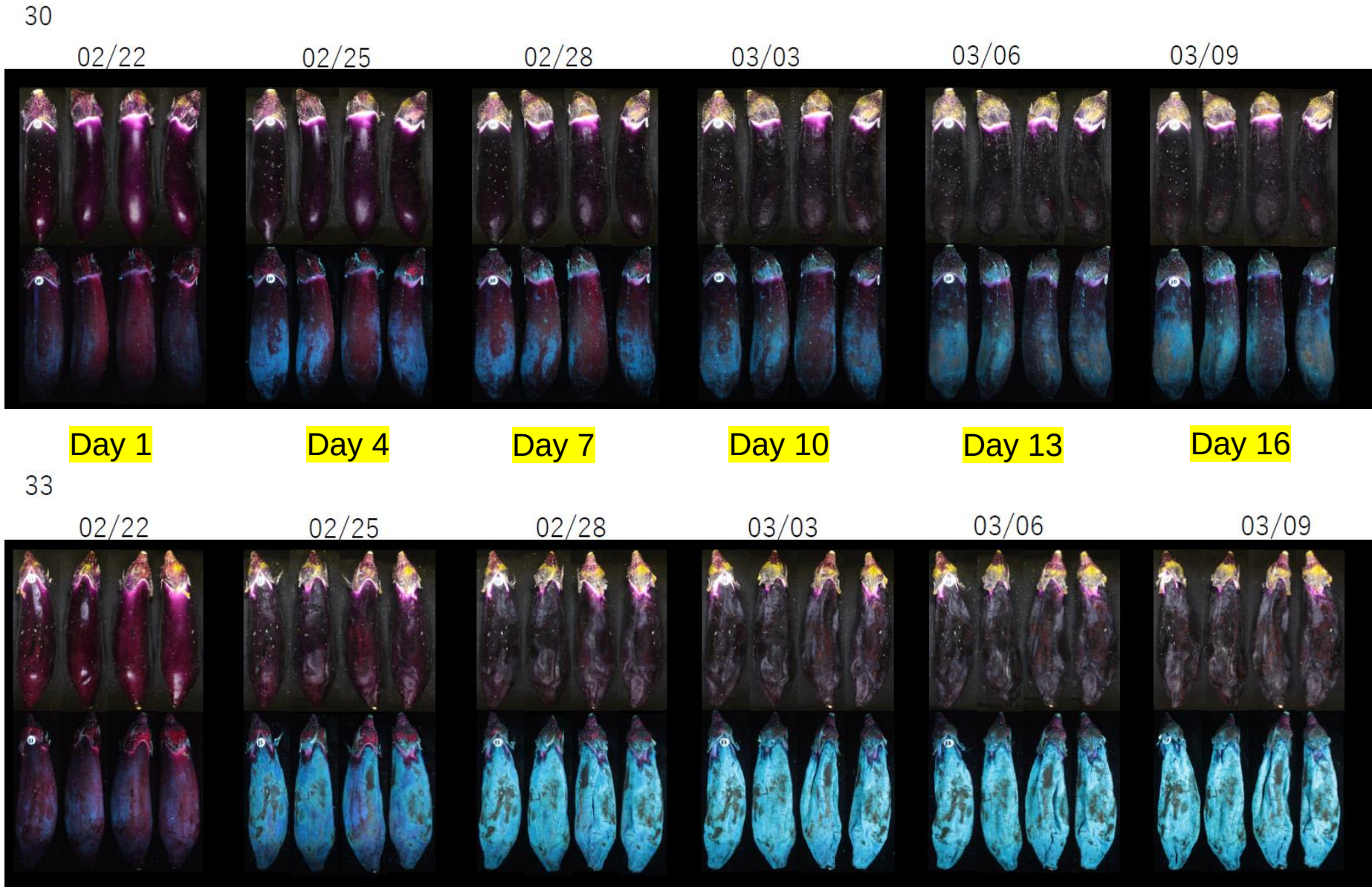
A combination of temperature and cuticular pitting increases water loss

Temperature has a major effect on moisture loss

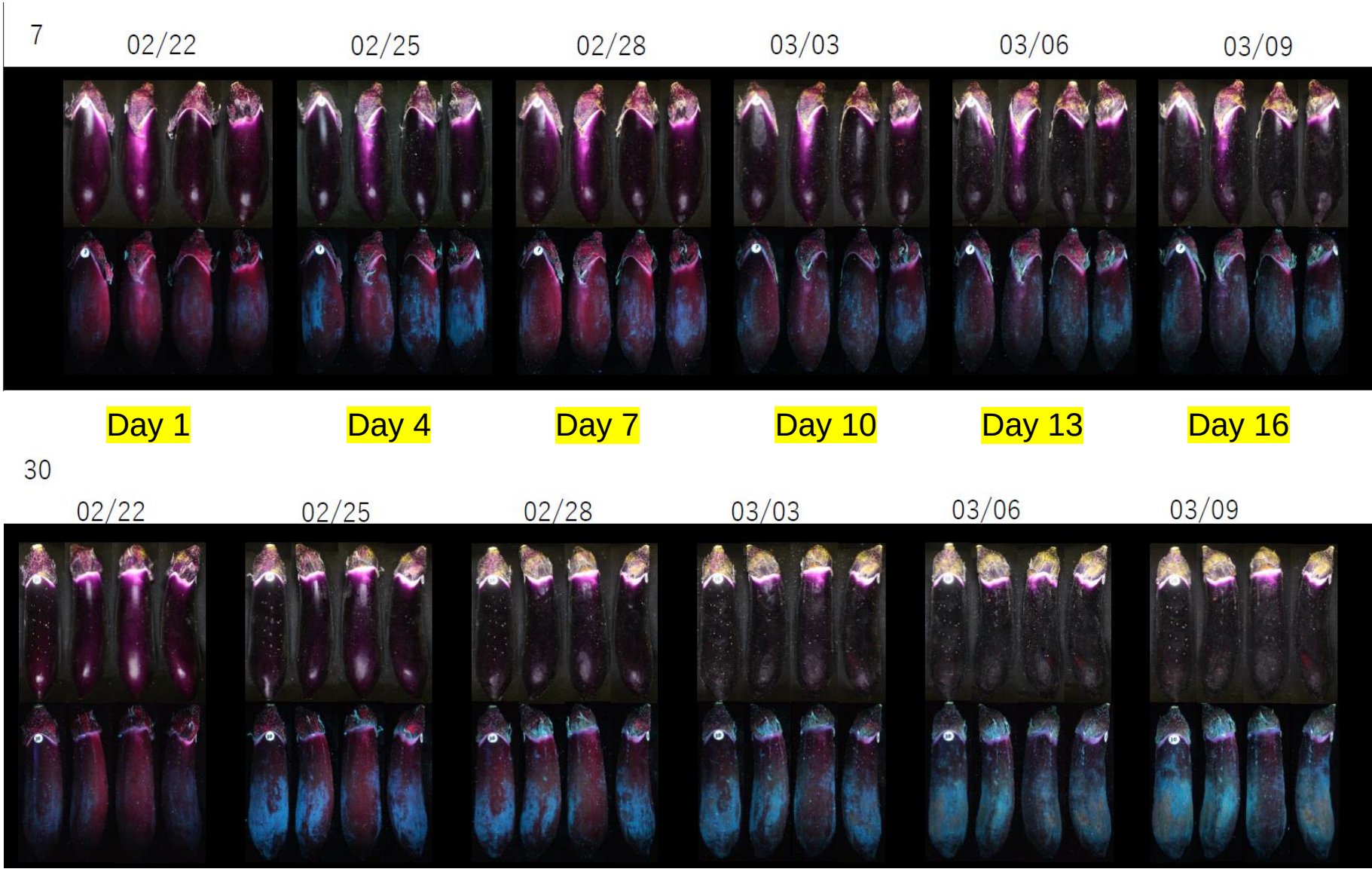
Images (Intact fruits) – both 10°C & 20°C



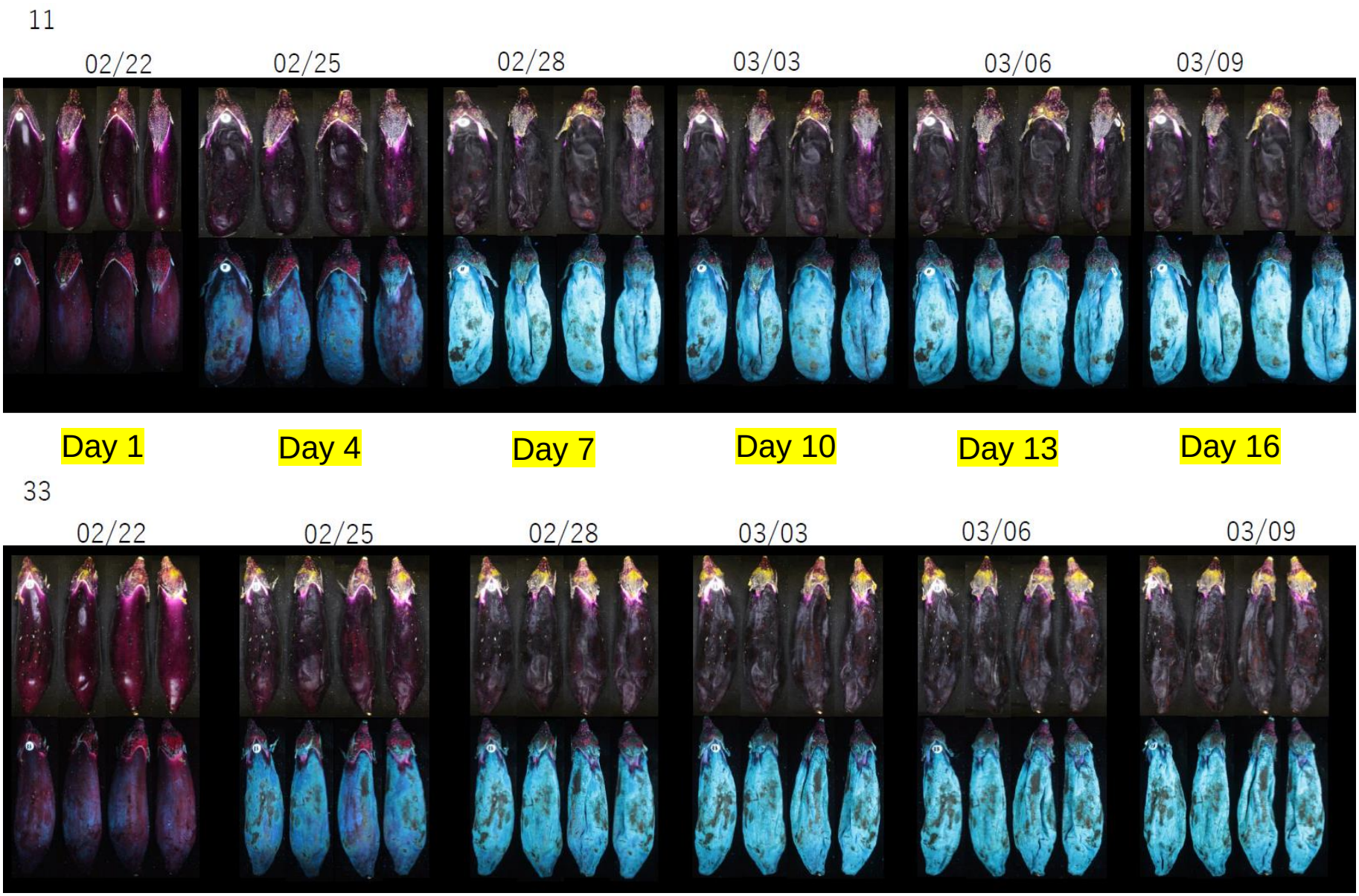
Images (Artificial pitting at different temperature)



Intact vs artificial pitting- 10°C

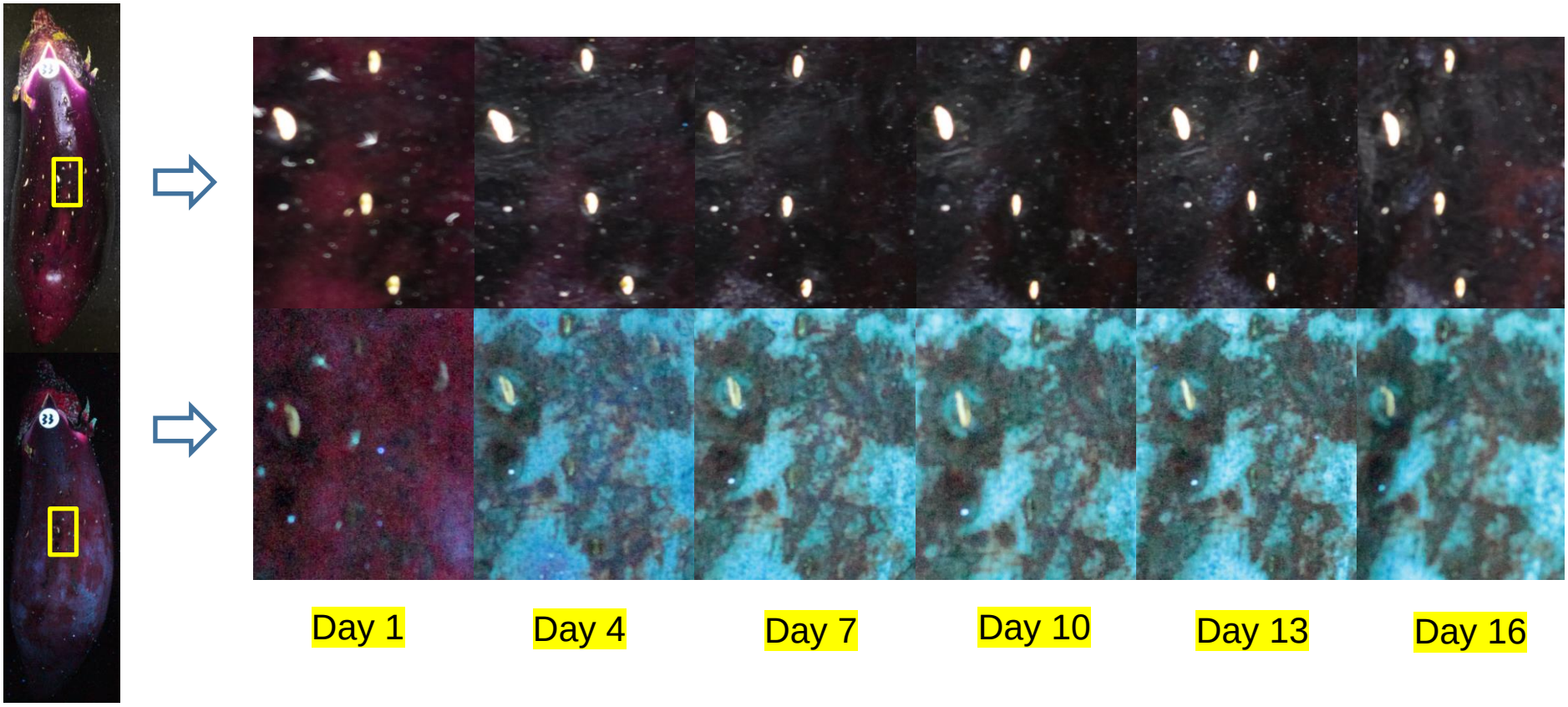


Intact vs artificial pitting- 20°C



Artificial pitting evolution

Sample No. 33



Suberization - Suberin is released as the sealing tissue after wounding or abscission

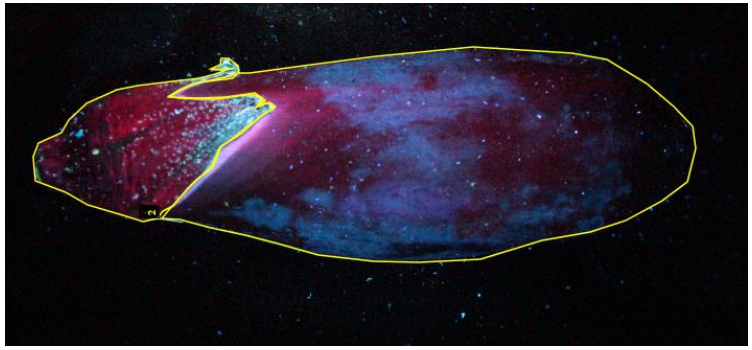
https://www.frontiersin.org/articles/10.3389/fchem.2015.00062/full

Conclusion

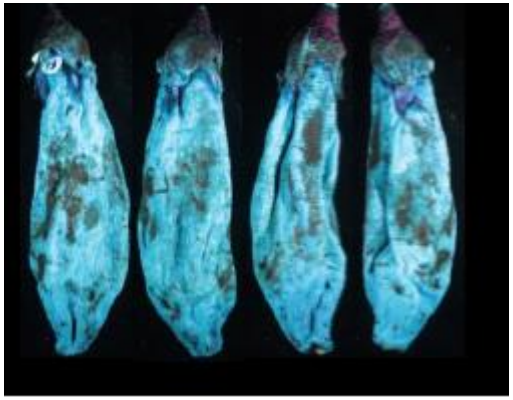
- Artificially pricked fruits lose moisture rapidly, lose skin firmness, and fluoresce strongly
- Fruits with intact skins and transpiration occurring only through the cuticle have a good shelf life due to high moisture diffusion resistance

Future plan

- Image processing and analysis
- Determine the correlation between the observed image changes and moisture loss
- Incorporate shrinkage data and EEM



Discriminate between the calyx and the fruit part



Shrinkage due to water loss

Thank you for listening