How physical treatments can improve quality in postharvest ?

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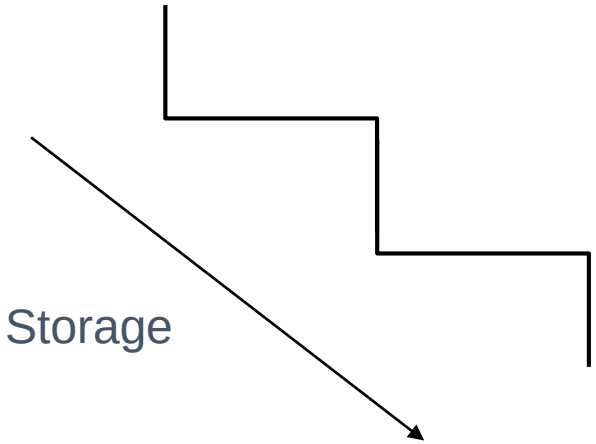
After harvest…

Harvest fruits and vegetables are metabolically active



Maturation / Senescence

Quality decrease :

- **Browning**
- Tissue softening
- Microbial decay
- Off flavor and aroma development

Postharvest treatments :

Why ?

★ To slow down physiological process
★ To reduce enzymatic reactions
★ To reduce / inhibit microbial growth

Refrigerated temperature

Controlled / Modified atmosphere

…. Sometimes not sufficient
New innovations…

The "**Physiology and Quality**" team, in conjunction with the other QUALISUD teams, works to uphold and improve the quality of fruits and vegetables (nutritional, organoleptic and sanitary quality), and to limit their post-harvest losses by design innovative technical procedures and understanding the mechanisms involved.

Physiological approach ⇔ Technical approach

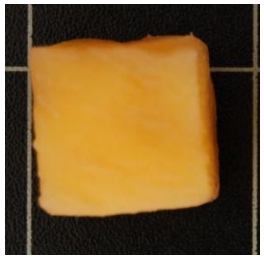
Heat treatment

Traditionnaly, applied by immersion in hot water (40 – 60°C, short time)

Quarantine treatment for mangoes (46°C – 50 min)

Heat treatment to reduce browning of fresh-cut mangoes

Thesis 2007 – 2010, Tassadit Djioua

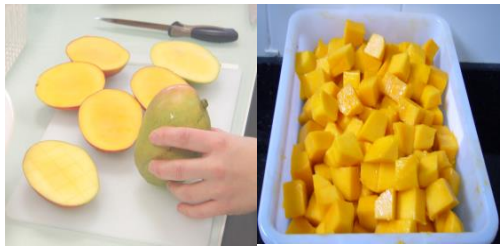


Heat treatment on mangoes

Experimental protocol :

Mangoes
(Kent, Keitt, Tommy Atkins)

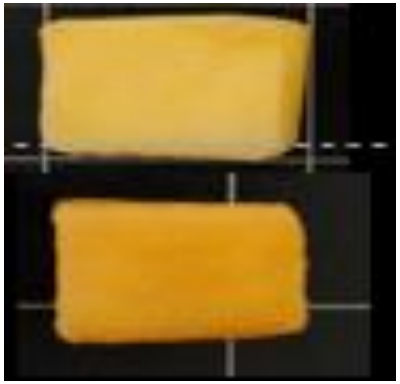
Hot Water Treatment (HWT) : 46° C, 30min / 46° C, 75 min / 50° C, 30 min / 50° C, 75 min



Cut

Storage 6°C / 9j

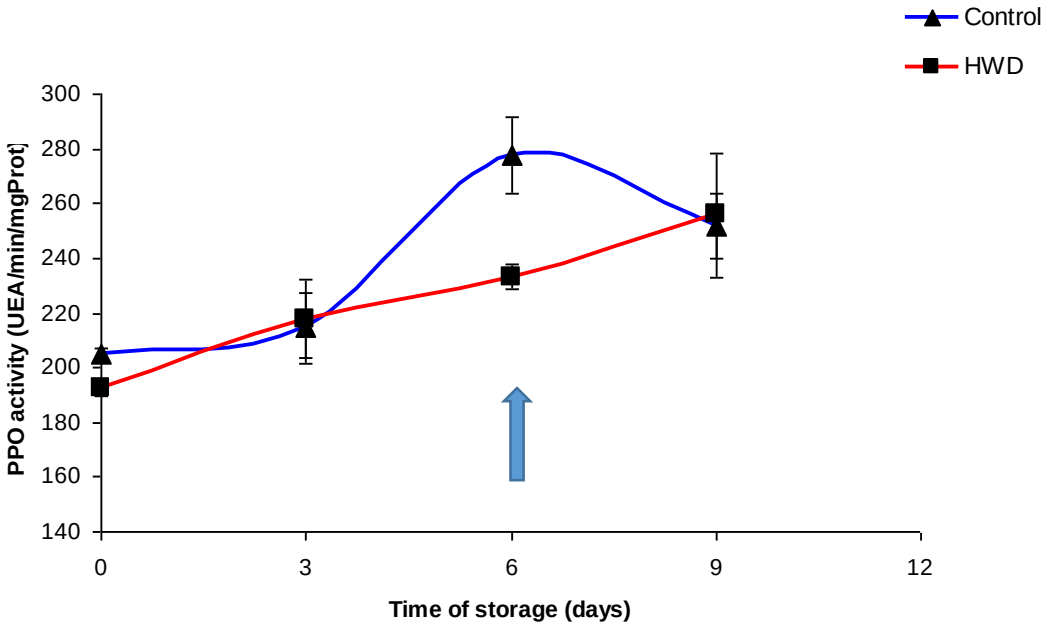
Impact of HWT on browning :



HWT
50° C, 30 min

Control

Mangoes at day 6



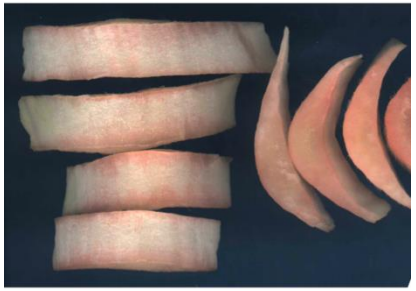
HWT decreased the PPO activity

Djioua et al., 2009. Postharvest Biology & Technology

The impact of thermal treatment on fresh-cut witloof

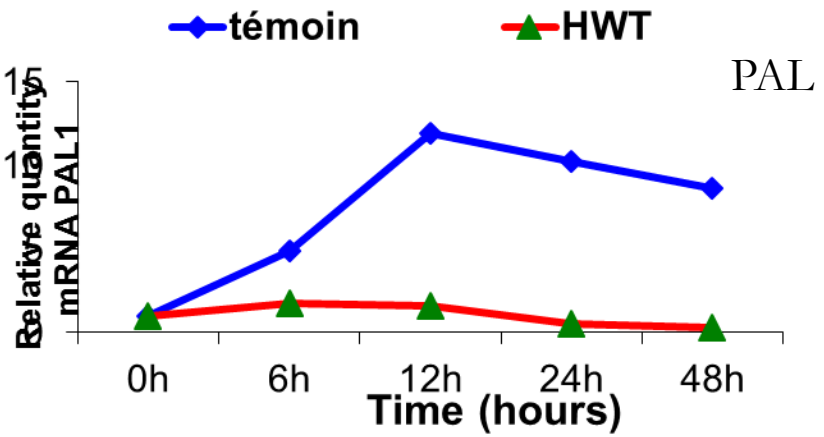
Thesis 2012 – Abir Salman

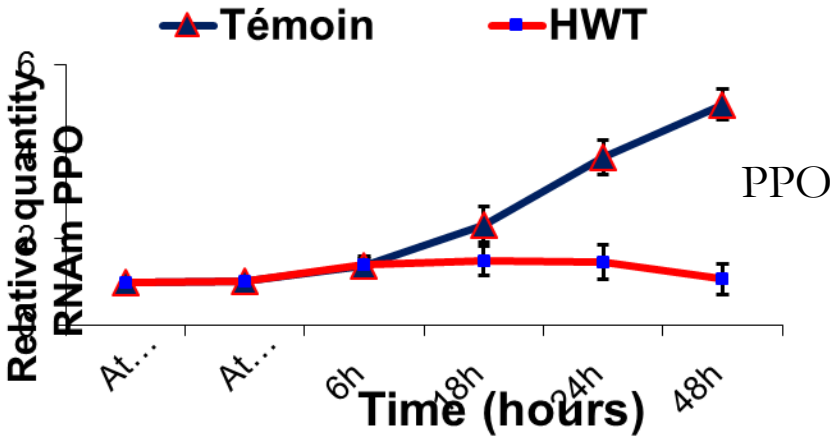
Browning change after 48 h à 10° C



Control

HWT 46 °C 2 min





HWT : decreased PAL and PPO activity AND the transcription of ARNm of these two keys enzyme in browning

Salman et al., 2008. European Food Research and Technology / Salman et al., 2009. European Food Research and Technology

Visible light treatment

The impact of visible light on senescence and quality of fresh-cut lettuces

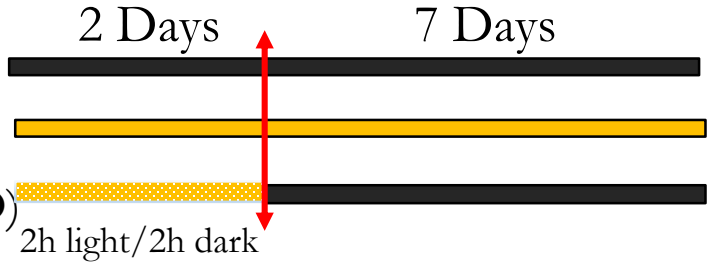
Current project

Experimental protocol :

Darkness

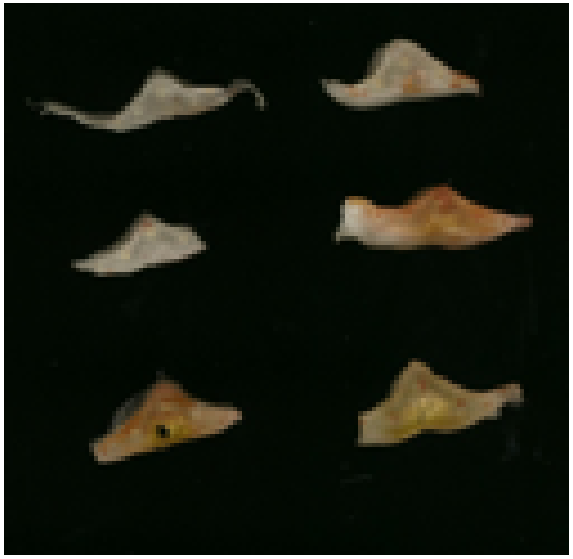
50 / 150 µmol $m^{-2}s^{-1}$ (C)

50 / 150 µmol $m^{-2}s^{-1}$ (LD)



Storage at 6° C

Darkness

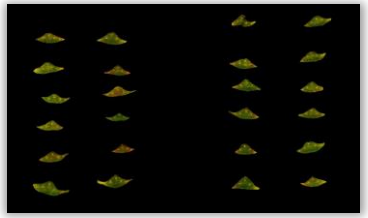


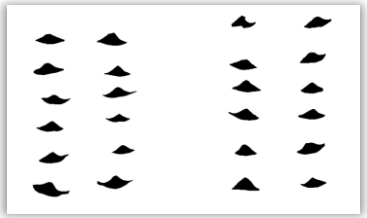
Continue Light (C)

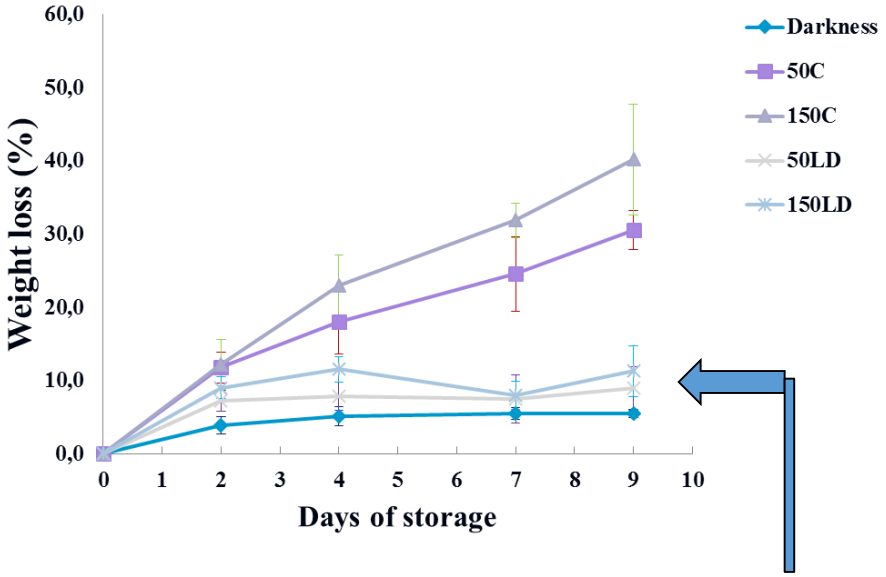
Pre-treatment with light (LD)

Image analysis

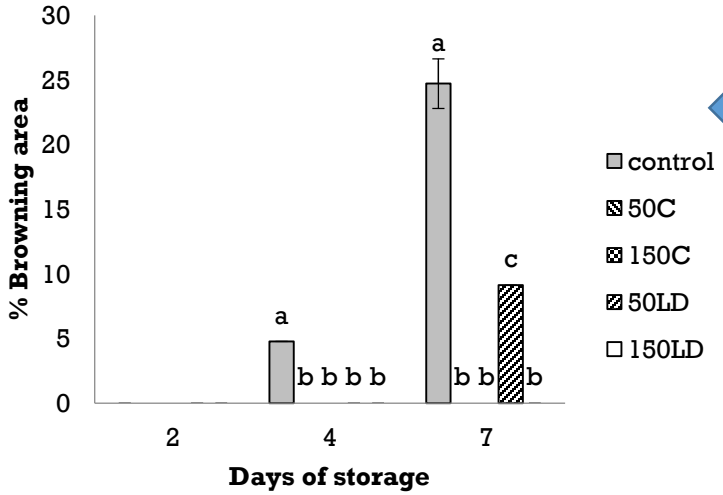
ImageJ
Image Processing and Analysis in Java







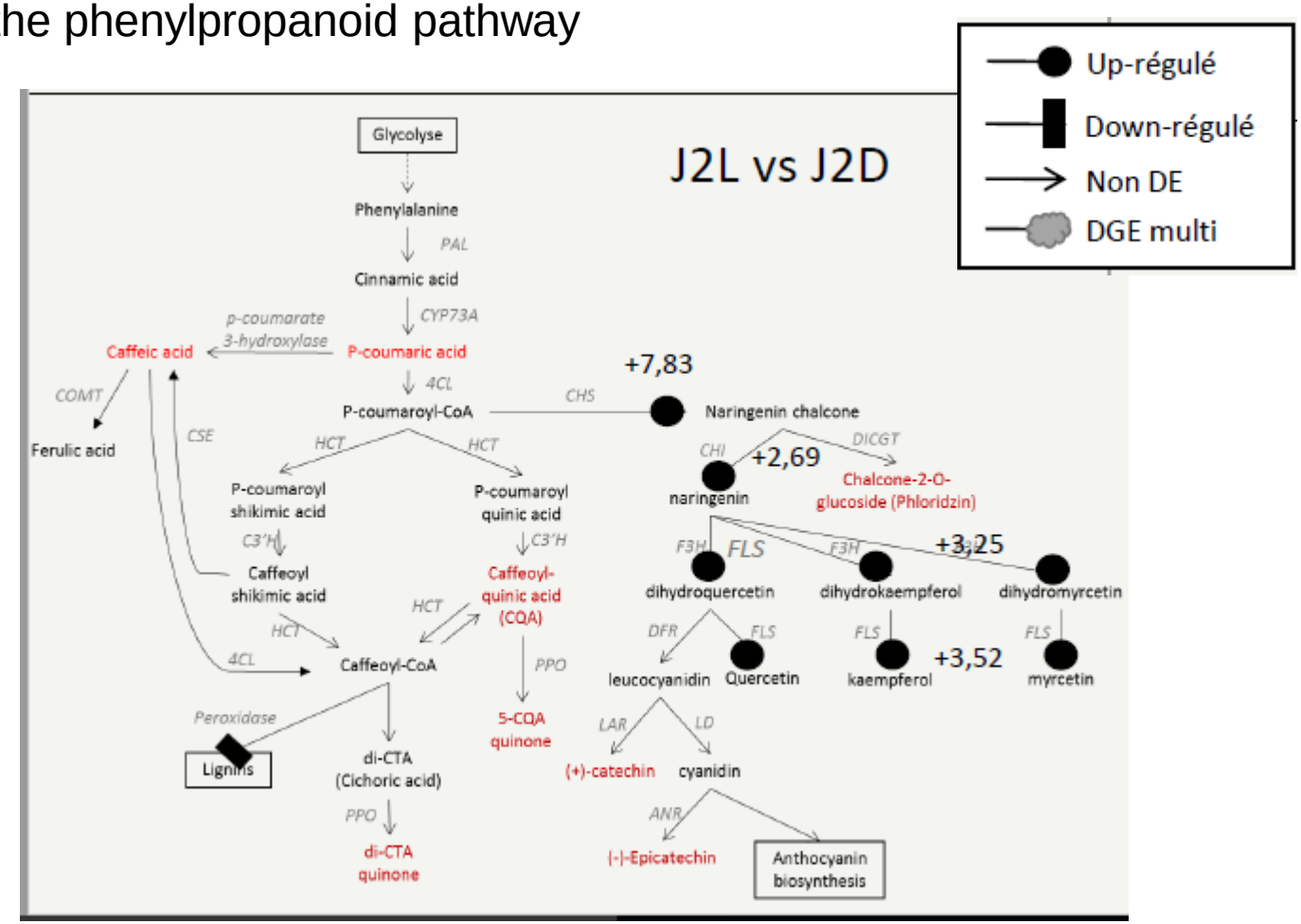
Pre-treatment (LD) decreased the weight loss



Light treatment (C and LD) decreased the browning process of fresh-cut lettuces

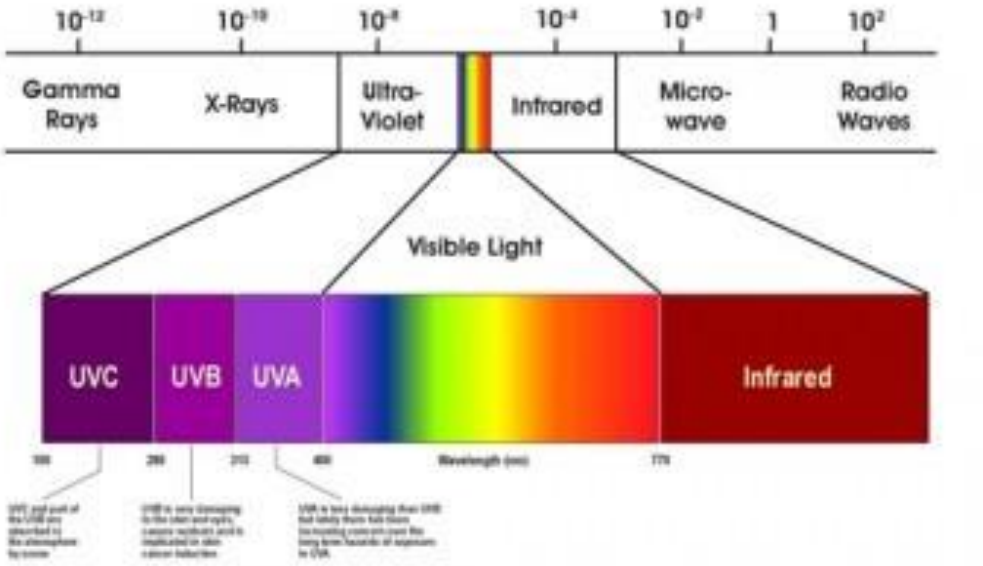
Analyse NGS (David Roux – Julie Ripoll)

Change of the phenylpropanoid pathway



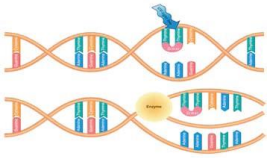
Chalcone synthase pathway : up-regulated : More anthocyans, Less ortho-diphenol = Substrate of PPO

UV-C treatment



UV-C (100 to 280 nm)

★ Germicidal effect

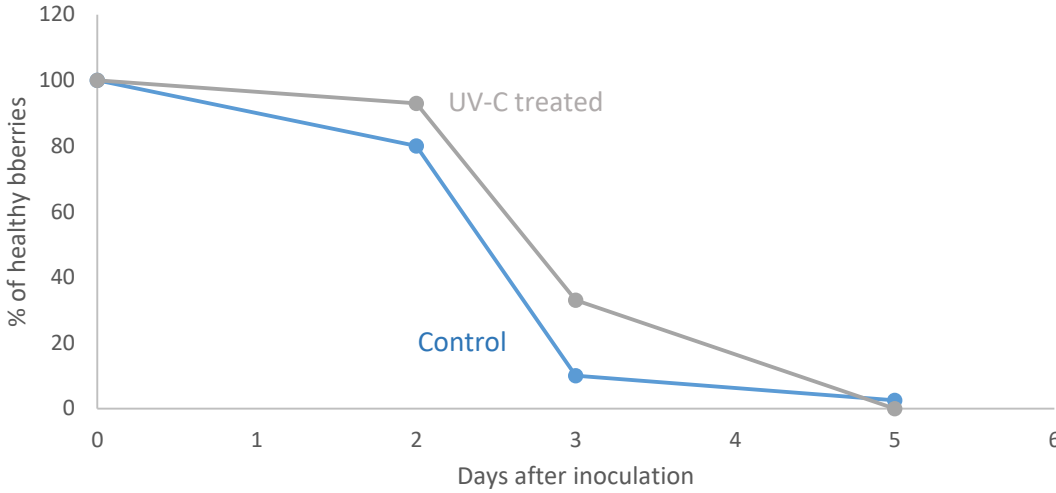


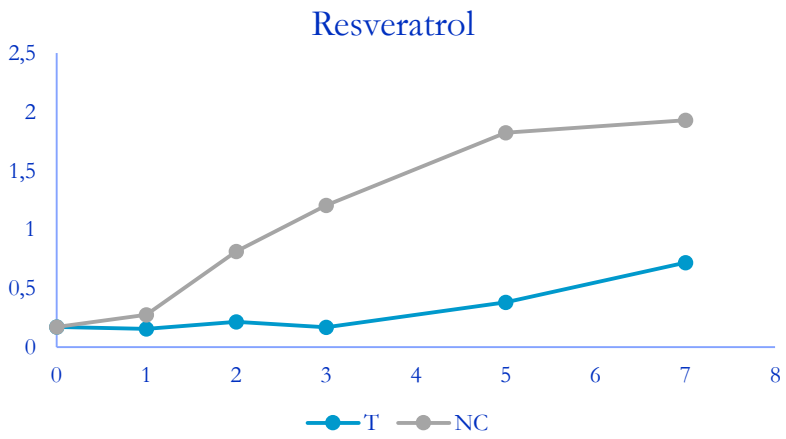
★ Hormetic effect : Defense stimulation

D²BIOFRUITS Project. (Développement d'une méthodologie d'évaluation des pertes post-récolte et étude de l'efficacité de procédés compatibles avec l'agriculture Biologique pour Décontaminer et Désinsectiser les Fruits)

Projet Casdar -2014 – 2017

UV-C (4 kJ.m^{-2})





UV-C radiations, a tool to stimulate strawberry plant defense in progress of cultivation and to improve conservation / quality of fruit after harvest

Current thesis, Marine Forges

Experimental protocol :

Botrytis cinerea

UV-C

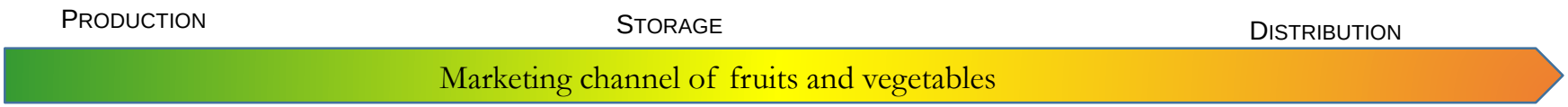
UV-C

➢ Objectives:

- Evaluate the **sensitivity level of strawberry plants** against *Botrytis cinerea* thanks to application of UV-C radiations on leaves

- Evaluate the **conservation / quality of strawberry fruits** after harvest thanks application of UV-C radiations **BEFORE / AFTER** harvest

« Improve the postharvest quality of fruits and vegetables »



UMT IQUAR

National project - 2017 – 2021

Leaders : Sébastien Lurol (CTIFL), Florence Charles (Avignon University)