جامعة السلطان قابوس
Sultan Qaboos University

Speaking at:

The contribution of impact damage to the quality changes of stored banana fruits

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Sultan Qaboos University
Oman

Outline

Introduction

Background

01

Mechanical damage in fresh produce is the main cause of quality damage and many other postharvest losses during the stages of handling, transporting, and storage

(Pathare and Al-Dairi, 2021).

02

Bruising that primarily occurs during handling and other postharvest processes is the most prevalent type of mechanical damage for most fresh produce

(Opara and Pathare, 2014).

Introduction Cont.

Background

03

Impact damage can occur when fruits fall with a particular and sufficient force against another fruit or surface (Htike et al. 2021).

04

Bruising can affect the internal and external attributes of fruits and can alter the physiological and metabolic processes and increase postharvest decay (Fadiji et al. 2016).

05

Banana is a climacteric perishable fruit, making it highly prone to postharvest losses during postharvest handling and transportation (Wasala et al. 2014).

Introduction Cont.

Objective & Novelty

Objective

To evaluate the local banana quality changes affected by **three impact energies** (low, medium, and high) resulting from the simulated handling practices during storage at **three different temperature conditions** (5, 10, and 22°C) for **12 days**.

Novelty

There is a dearth of information related to the effect of bruising on banana fruits. Therefore, this study evaluated the effect of simulated handling practices on the mechanical damage of bananas by a pendulum technique.

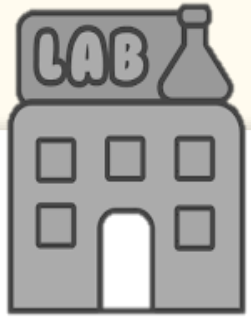
Methodology

Experimental setup

Sample preparation

Banana (cv. Malindi)
Muscat, Oman

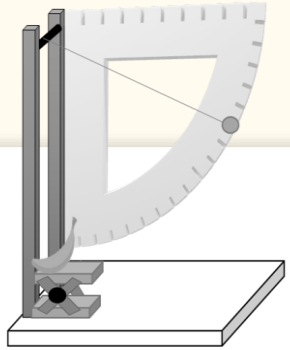
01



Laboratory

Postharvest Technology Laboratory at Sultan Qaboos University.

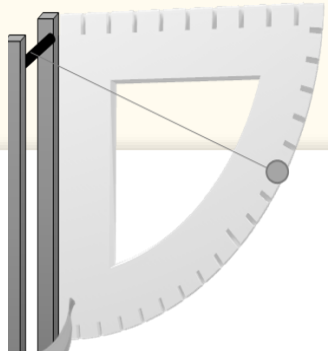
02



Simulated impact test

Pendulum test

03



Impact level

30°- Low (0.07 J)
45°- Med. (0.160 J)
60°- High (0.270 J)

04

Storage temp. & duration

- 5°C, 13°C & 22°C
- For 12 days.

05

Methodology Cont.

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Banana (cv. Malindi)
Muscat, Oman

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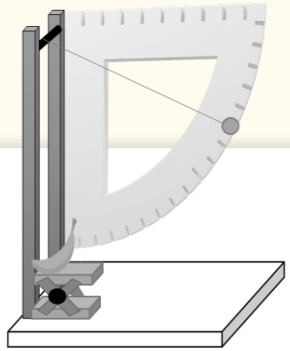

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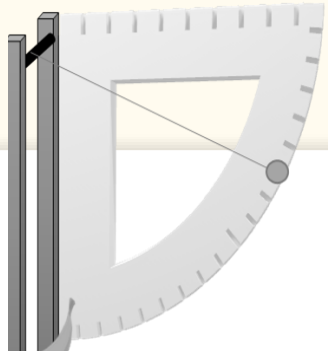

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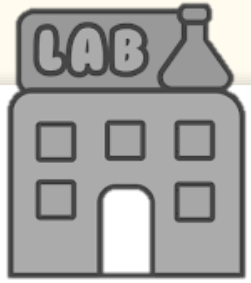

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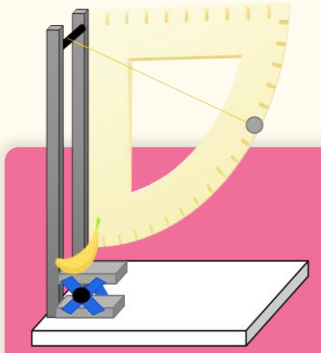

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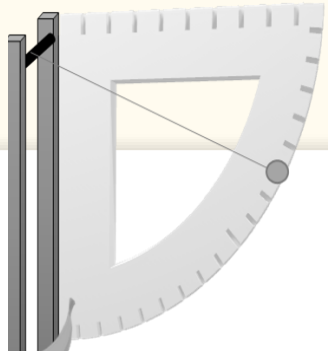

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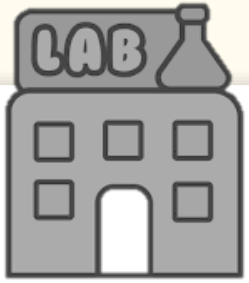

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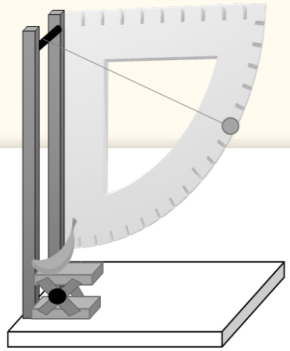

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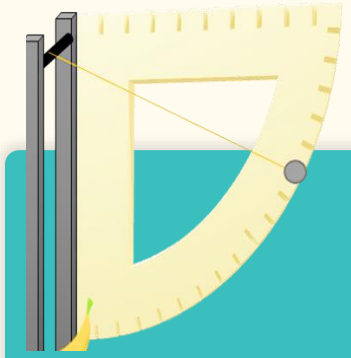

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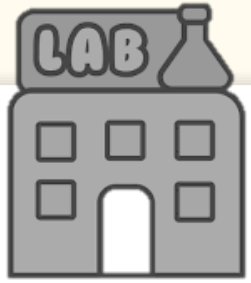

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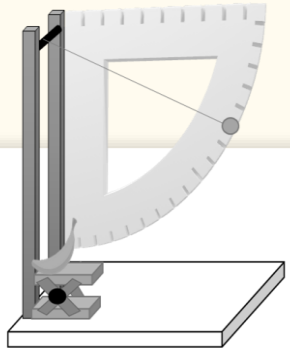

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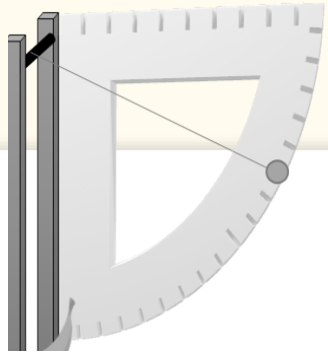

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Methodology Cont.

Quality measurements and statistical analysis

Weight loss %

Electronic weight balance

In term of unit mass

Transpiration rate

Firmness

Fruit firmness tester

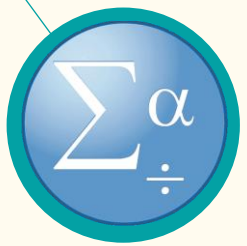
Computer vision system

Peel color

(*L** & *a**)

Statistical analysis

3-Way Analysis of Variance



a*

L*

Firmness

TRm

WL %

Results & Discussion

a*

L*

Firmness

TRm

Results & Discussion Cont.

Weight loss %

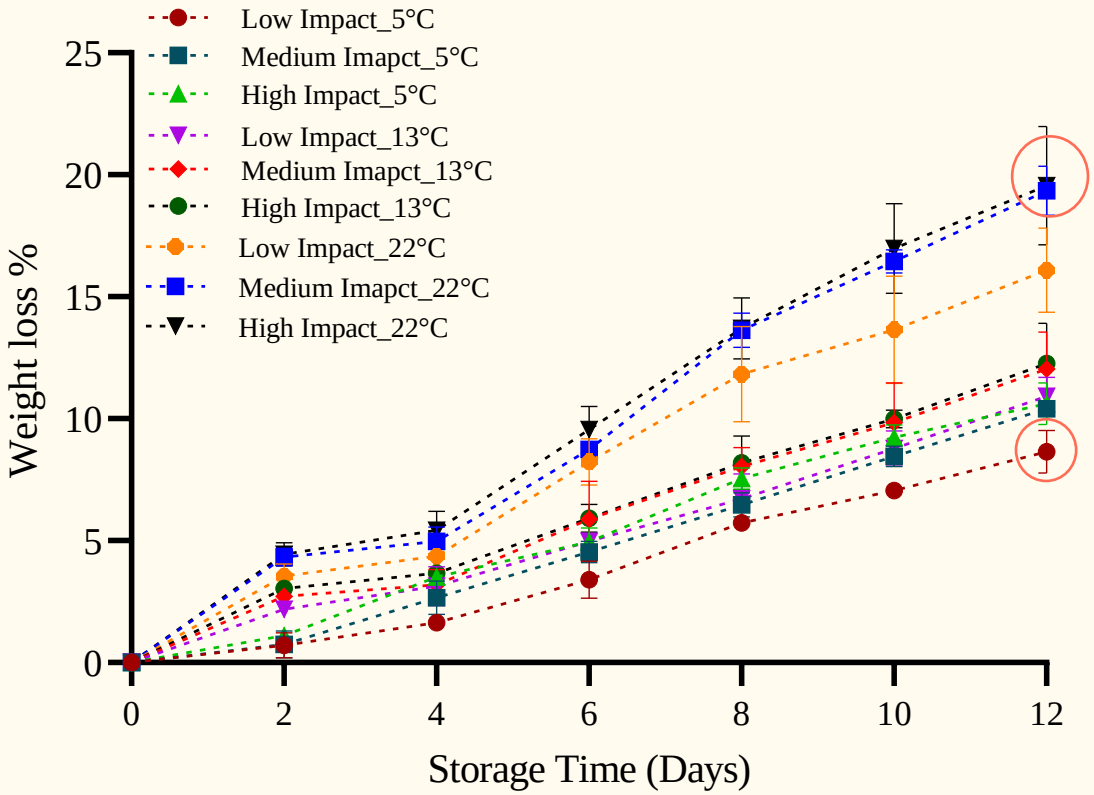


Figure 1. Weight loss % of banana fruit bruised at low, medium, and high impact energy levels and stored 5°C, 13°C and 22°C storage conditions for 12 days. Error bars represent standard deviation (SD) of the mean values ±S.D. of 3 replicates.

WL %

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a*

L*

Firmness

Results and Discussion Cont.

Transpiration rate, TRm (mg kg−1 s −1)

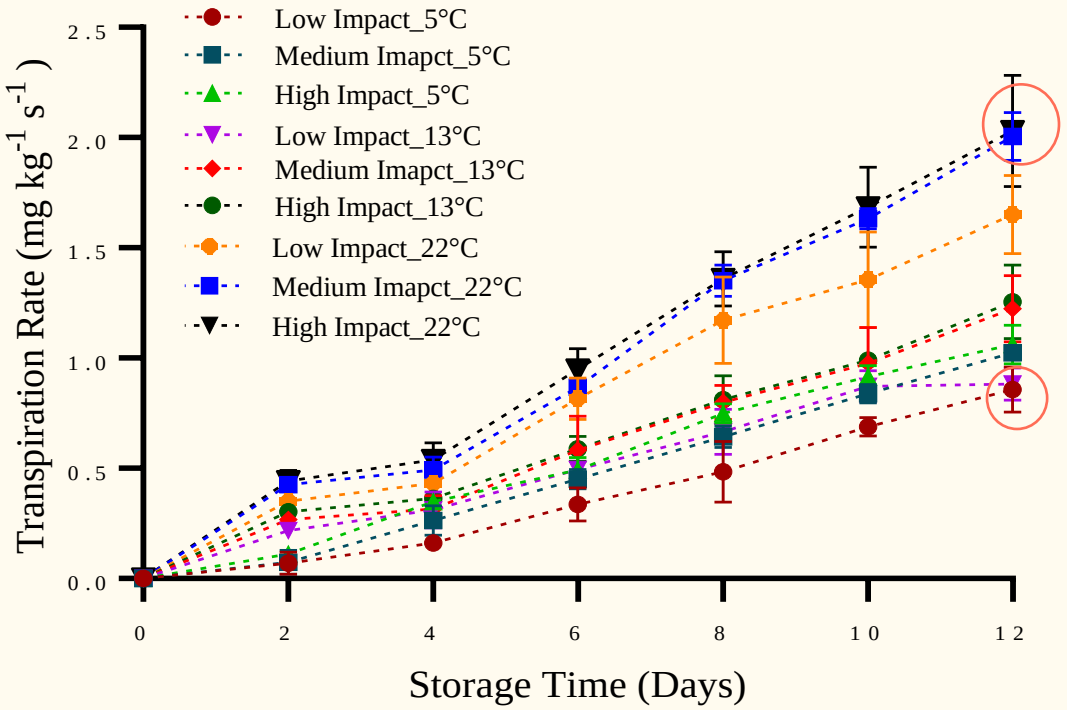

Figure 2. Transpiration rate mg kg−1 s −1of banana fruit bruised at low, medium, and high impact energy levels and stored 5°C, 13°C and 22°C storage conditions for 12 days. Error bars represent standard deviation (SD) of the mean values ±S.D. of 3 replicates.

TRm

WL%

Results and Discussion Cont.

Firmness (N)

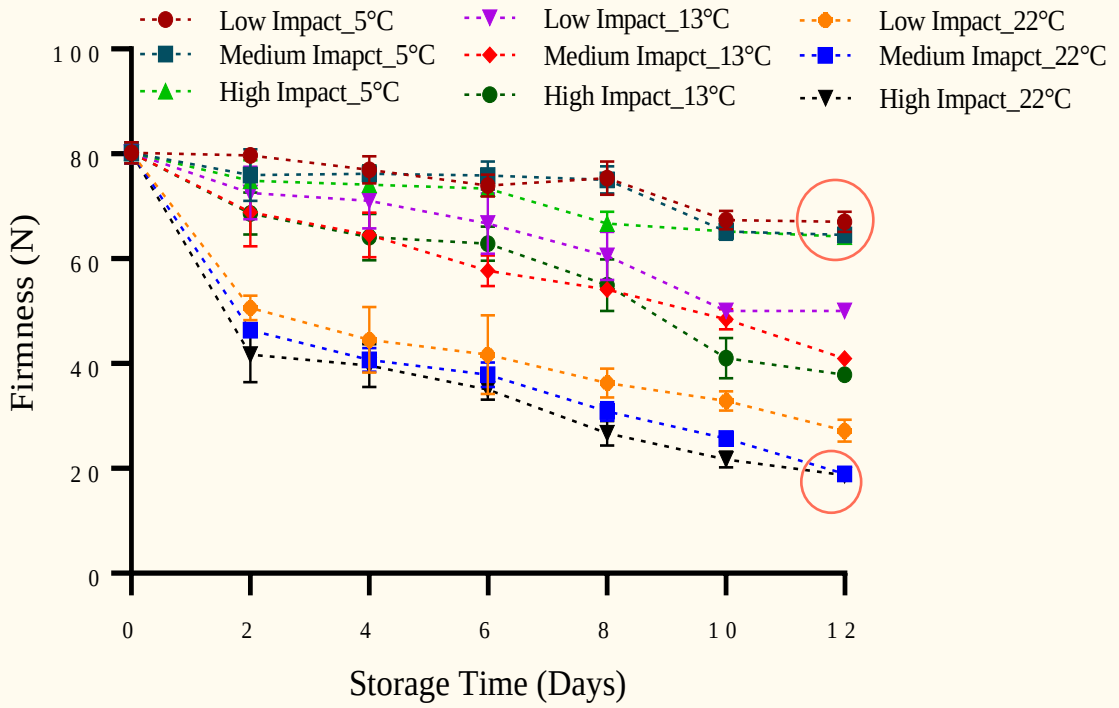

Figure 3. Firmness (N) of banana fruit bruised at low, medium, and high impact energy levels and stored 5°C, 13°C and 22°C storage conditions for 12 days. Error bars represent standard deviation (SD) of the mean values ±S.D. of 6 replicates.

a*

L*

Firmness

TRm

WL%

Results and Discussion Cont.

Lightness (L^*)

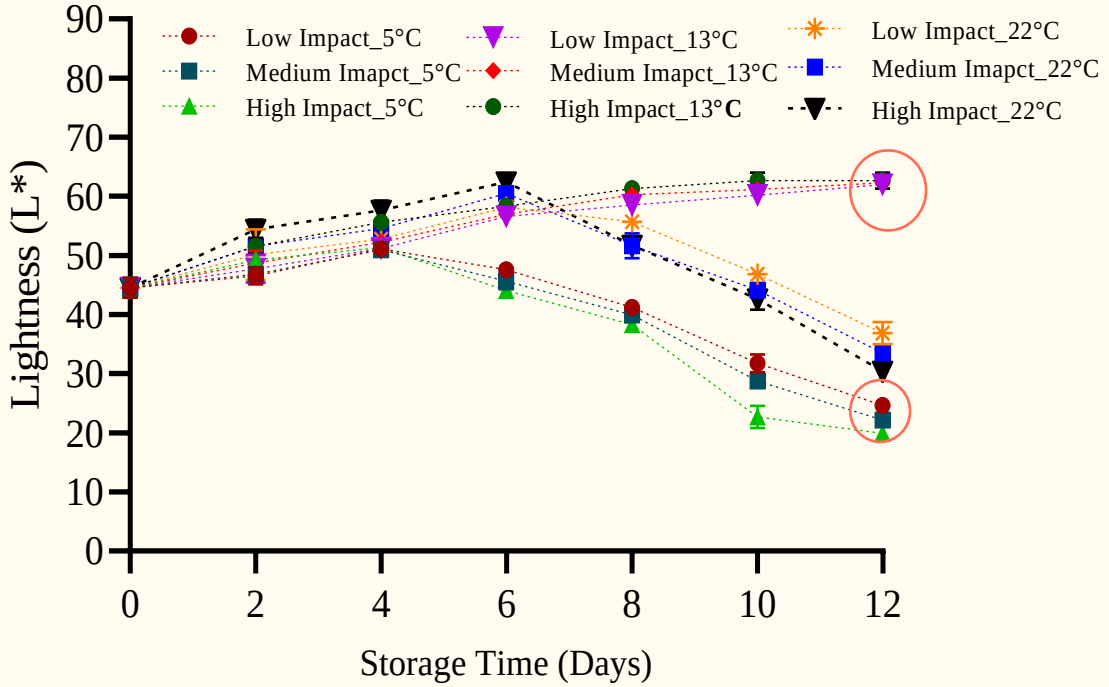

Figure 4. Lightness (L^*) of banana fruit bruised at low, medium, and high impact energy levels and stored 5°C, 13°C and 22°C storage conditions for 12 days. Error bars represent standard deviation (SD) of the mean values ±S.D. of 15 readings of 3 replicates.

Results and Discussion Cont.

Redness & greenness (a*)

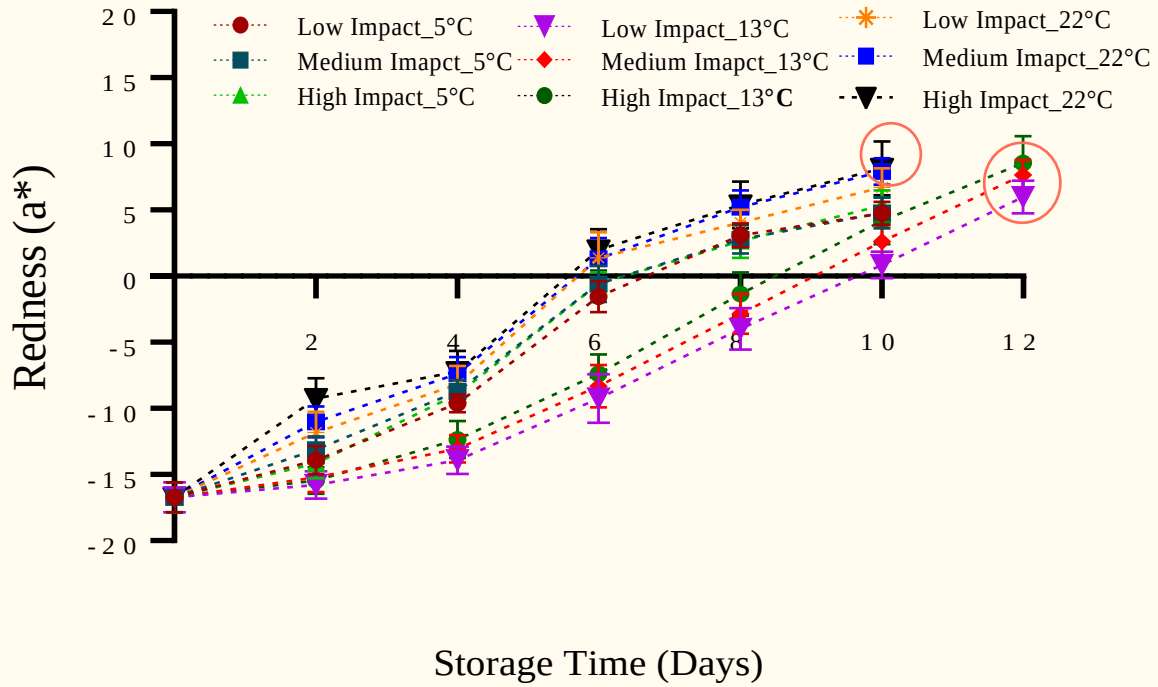

Figure 5. Redness & greenness (a*) of banana fruit bruised at low, medium, and high impact energy levels and stored 5°C, 13°C and 22°C storage conditions for 12 days. Error bars represent standard deviation (SD) of the mean values ±S.D. of 15 readings of 3 replicates.

a*

L*

Firmness

TRm

WL%

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Conclusions & Recommendations

01

Mechanical damage like bruising induced the occurrence of weight loss reduction and color lightness changes over time, particularly at 22°C.

02

The firmness of bruised banana fruits reduced as storage temperature and impact level increased during experimental days.

03

Storage at 13°C reduced the appearance of severe damages of bruising in banana fruits.

04

Increment of transpiration rate was kindly associated with both storage temperature and bruising.

Conclusions & Recommendations

01

Bruise Susceptibility Studies

Very helpful in preventing damage during handling operations.

02

Instrumented Sphere Technologies

Permit real-time monitoring and evaluation of packing lines to identify critical control points.

03

Labour Training

- Handle the crop gently.
- Harvesting at proper maturity.
- Installing padding inside bulk bins.
- Avoiding over or under-packing of containers.

Acknowledgments

جامعة السلطان قابوس
Sultan Qaboos University

Sultan Qaboos University internal grant

Projects Code:

- IG/AGR/SWAE/19/03
- IG/AGR/Dean/ 18/01

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04. Pathare, P.B.; Al-Dairi, M. Bruise Susceptibility and Impact on Quality Parameters of Pears During Storage. *Front. Sustain. Food Syst.* **2021**, *5*, 658132.

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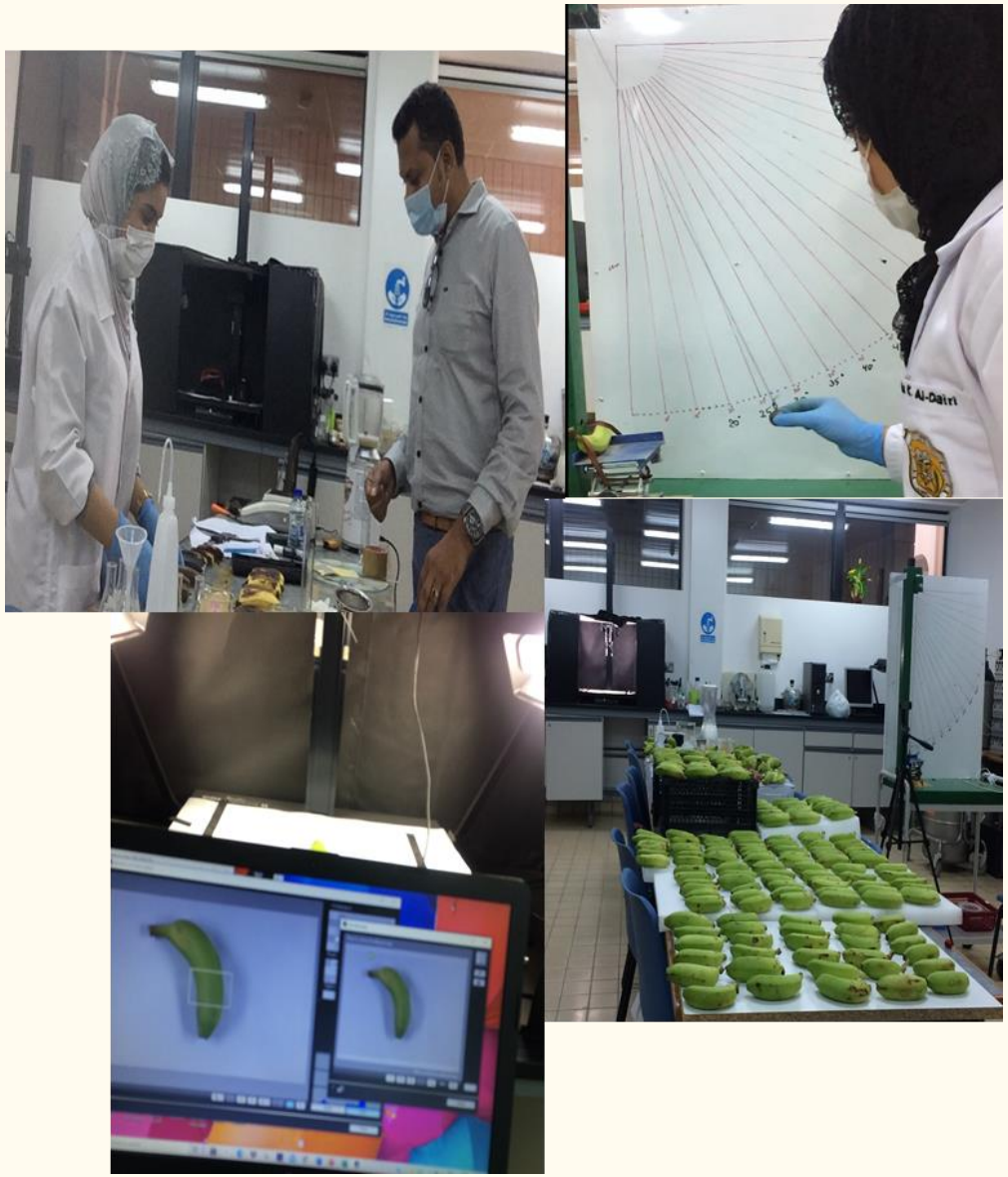

Thank You