International
Food Ionizing Processing
Symposium

IFIS

26-27-28
SEPTEMBER
2023
DALLAS
Texas, USA

WWW.IFIS.WORLD

DAY ONE

TUESDAY SEPTEMBER 26TH


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TEXAS A&M AGRILIFE


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AGENDA
& SPEAKERS
2023


WELCOME
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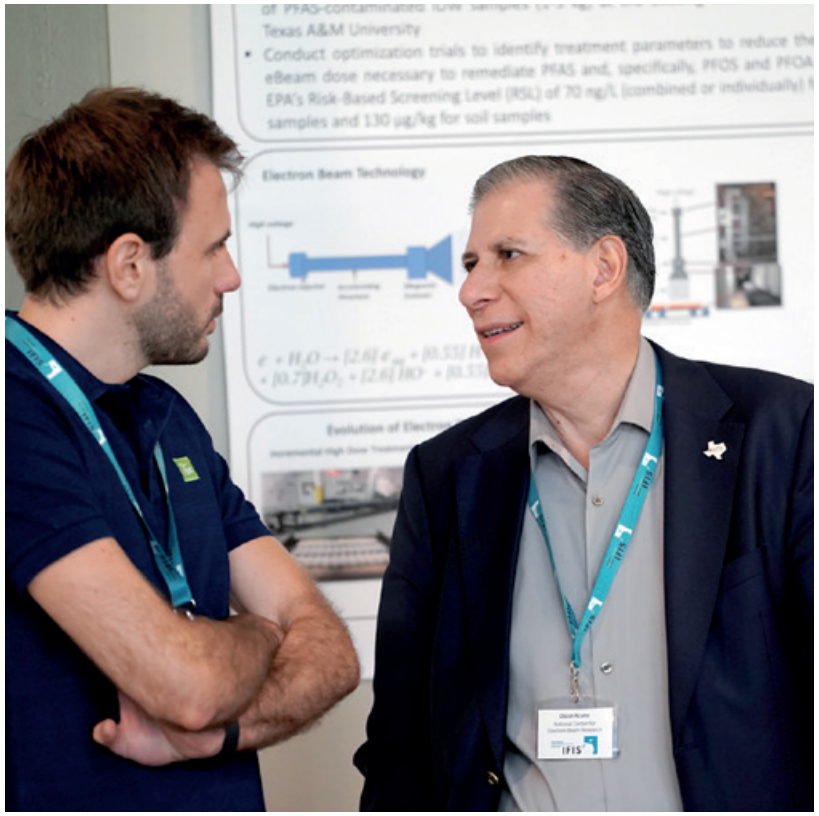
2023


IFIS
Eric Boers
IBA Industrial Solutions


Texas A&M University
Electron Beam Technology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PACKERS


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Oscar Acuna
National Center for
Electron Beam Research
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Emilie Herin
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SESSION ONE

STATUS OF COMMERCIALLY AVAILABLE TECHNOLOGIES AND TECHNOLOGIES IN THE HORIZON


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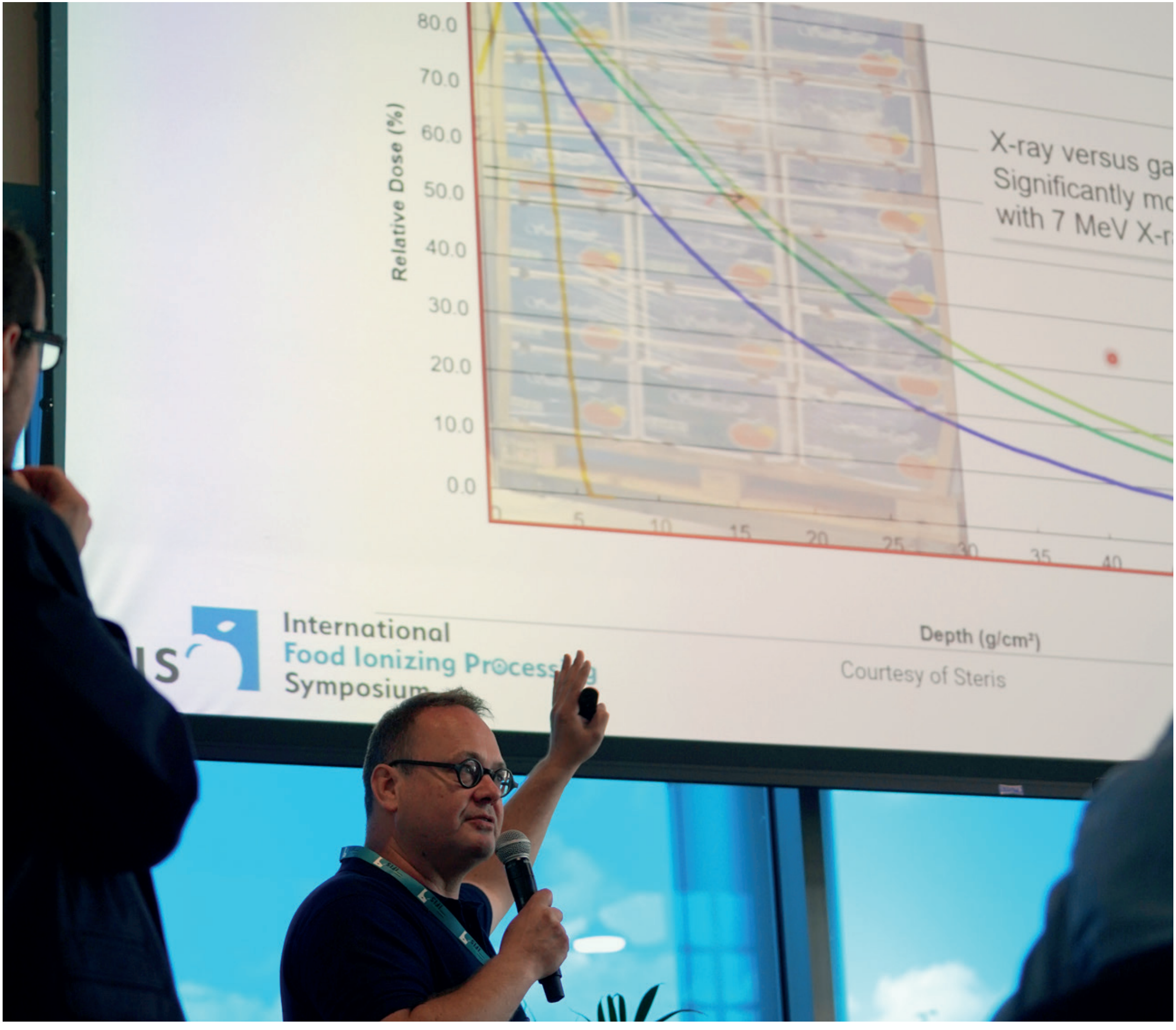
food irradiation
Cody Wilson
IFIS
Life. Science.


Relative Dose (%)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
0
5
10
15
20
25
30
35
40
Depth (g/cm²)
X-ray versus ga
Significantly mo
with 7 MeV X-r
International
Food Ionizing Processing
Symposium
Courtesy of Steris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DAY
ONE


THOUGHTS ON MEAT INDUSTRY NEEDS AND CHALLENG
X-RAY BEAM SOLUTIONS
ENHANCING THE FRESH PRODUCE INDUSTRY USING EL
LOW ENERGY HIGH POWER X-RAY FOR FOOD
IONIZING TECHNOLOGY NEEDS FOR FOOD PROCESSING
PANEL DISCUSSION: TECHNOLOGICAL OPTIONS FOR ANSWER
IFIS


THOUGHTS ON MEAT INDUSTRY NEEDS AND CHALLENGES
X-RAY BEAM SOLUTIONS
ENHANCING THE FRESH PRODUCE INDUSTRY USING ELECTRON BEAM
LOW ENERGY HIGH POWER X-RAY FOR FOOD
IONIZING TECHNOLOGY NEEDS FOR FOOD PROCESSING
PANEL DISCUSSION: TECHNOLOGICAL OPTIONS FOR ANSWERING INDUSTRY NEEDS
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SESSION TWO

ADOPTION OF IONIZING TECHNOLOGY IN THE FOOD VALUE CHAIN


al
ng Processing


SM58
SHURE
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Panel Discussion 1
Technological options for answering industry needs


to non-detectable levels
LA; LISTERA; etc.)
+
insects = low dose
inchanged
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izing Processing


U.S. Agencies & Associations En
(EPA)
U.S. ENVIRONMENTAL PROTECTION AGENCY
(AMI)
AMERICAN MEAT INSTITUTE
(AMA)
AMERICAN MEDICAL ASSOCIATION
(USDA-APHIS-PPQ)
U.S. DEPARTMENT OF AGRICULTURE
(GAO)
U.S. GOVERNMENT ACCOUNTABILITY OFFICE
(NFPA)
NATIONAL FOOD PROCESSING ASSOCIATION
International Agencies En
(IAEA) INTERNATIONAL ATOMIC ENERGY AGENCY

DAY TWO

WEDNESDAY
SEPTEMBER
27TH


ME TO
iTek
LLE, TX


1206
StarTek
FIRE LANE
NO PARKING


5
WELCOME TO
SteriTek
LEWISVILLE, TX
NO


SteriTek
Expert Sterilization Services


6
WELCOME TO
SteriTek
Sponsor


STERI-TEK
LEWISVILLE, TX
REVEAM

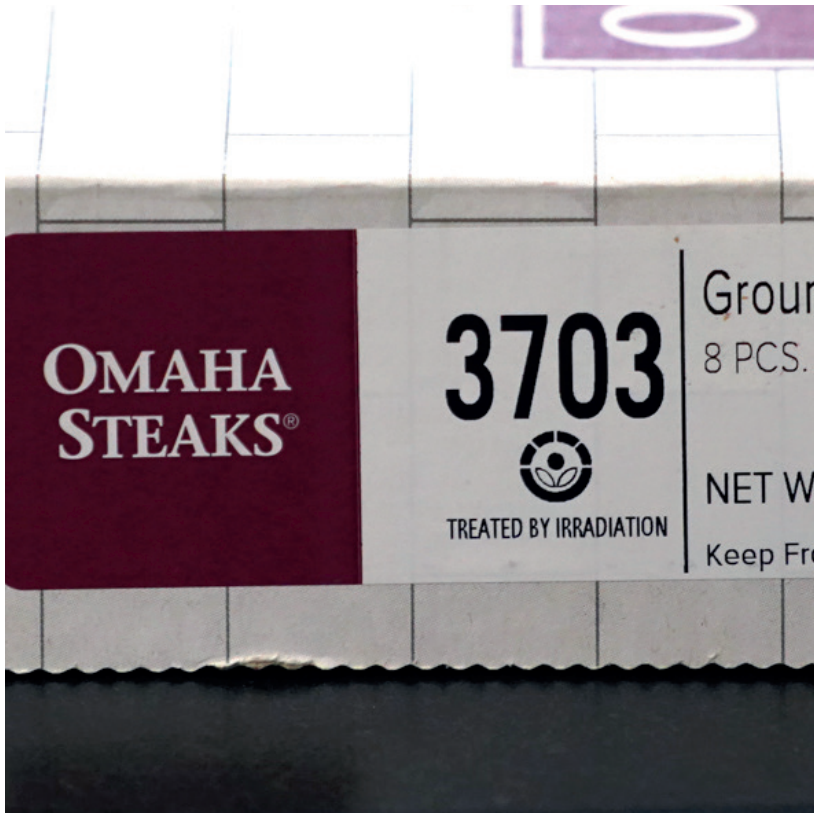

SteriTek
E-BEAM
PROCESSING
OVERVIEW
A LOOK A
STERI-TEK
HANDLES
6
7


PRE-
PROCESSING
PROCESSED


2023-09-27 10:50:28 Wed
Infeed 1
Outfeed 1
Rotator


CAUTION
HIGH RADIATION AREA
SignMission.com • 1-561-508-6513
OS-CR-P-1014-L-10170
StériTek
EVACUATION MAP


MODULATOR TANK 3


OMAHA
STEAKS®
3703
TREATED BY IRRADIATION
Groun
8 PCS.
NET W
Keep Fr


SteriTek
PERFORMANCE QUALIFICATION REVIEW
Per ISO 11137-3:


NOTICE
AUTHORIZED PERSONNEL ONLY
CAUTION
HIGH RADIATION AREA
CAUTION
HIGH RADIATION AREA


CAVENDER'S
Justin
N Main St
CAVENDER'S
STOCK YARDS
OUTFITTER
CAVENDER'S
STOCK YARDS
LETS
RODEO
Fort Worth
100 NW 26th St
Stockyards Blvd 100
TEXAS
I-35W NORTH


Budweiser
HACK
BURGERS BEER TO GO
BEER TO GO
WHITE ELEPHANT SALOON
SILVER & STONE
Yuengling
LAGER
Modelo
NOW SERVING COCKTAILS TO GO


CATTLEMEN'S CALIFORNIA
MAZE
ENTER HERE
SCENIC OVERLOOK
INSTRUCTIONS
NO SMOKING
NO SMOKING
LONGHORNS LIKE ME HAVE A HORN SPAN OF 4 TO 6 FEET. MINE ARE 4 FEET WIDE. How wide can you reach?
1'
2'
3'
4'
FORT WORTH HERD
CATTLE DRIVE
DAILY 11:30am & 4pm
Everyday* Weather Permitting
LIVESTOCK EXCHANGE BUILDING
MULE BARN
MULE BARN
STOCKYARDS STATION


Texas
BILLY BOB'S
TEXAS


BILLY BOB'S
TEXAS
TEXAS
2520
PRO BULL RIDING
Welcome
to
IFIS
DAYTIME
ADMISSION
$3.00
BOX OFFICE
&
MAIN ENTRANCE
ENTERTAINM
Nightly
Open


KC hats


BILLYBOBSTEXAS.COM
Bull Riding Tour
@BILLYBOBSTEXAS
MONTANA
SILVERSMITHS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BILLYBOBSTEXAS.C


Billy
Bob's
TEXAS


TEXAS


LIVE TEXAS


BUD LIGHT
Happy Dad
Coors LIGHT
Crown Royal
ICE COLD!


INDEPENDENT
LAST DROP


Corona
Extra

DAY THREE

THURSDAY
SEPTEMBER
28TH

SESSION THREE

FOOD IRRADIATION: CASE STUDIES FROM AROUND THE WORLD


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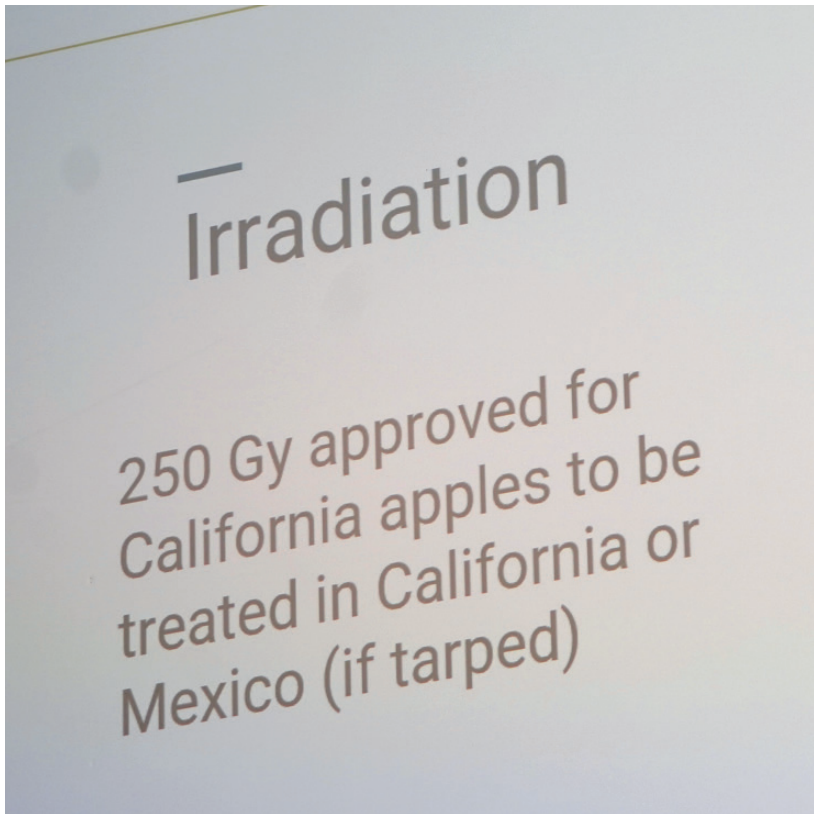
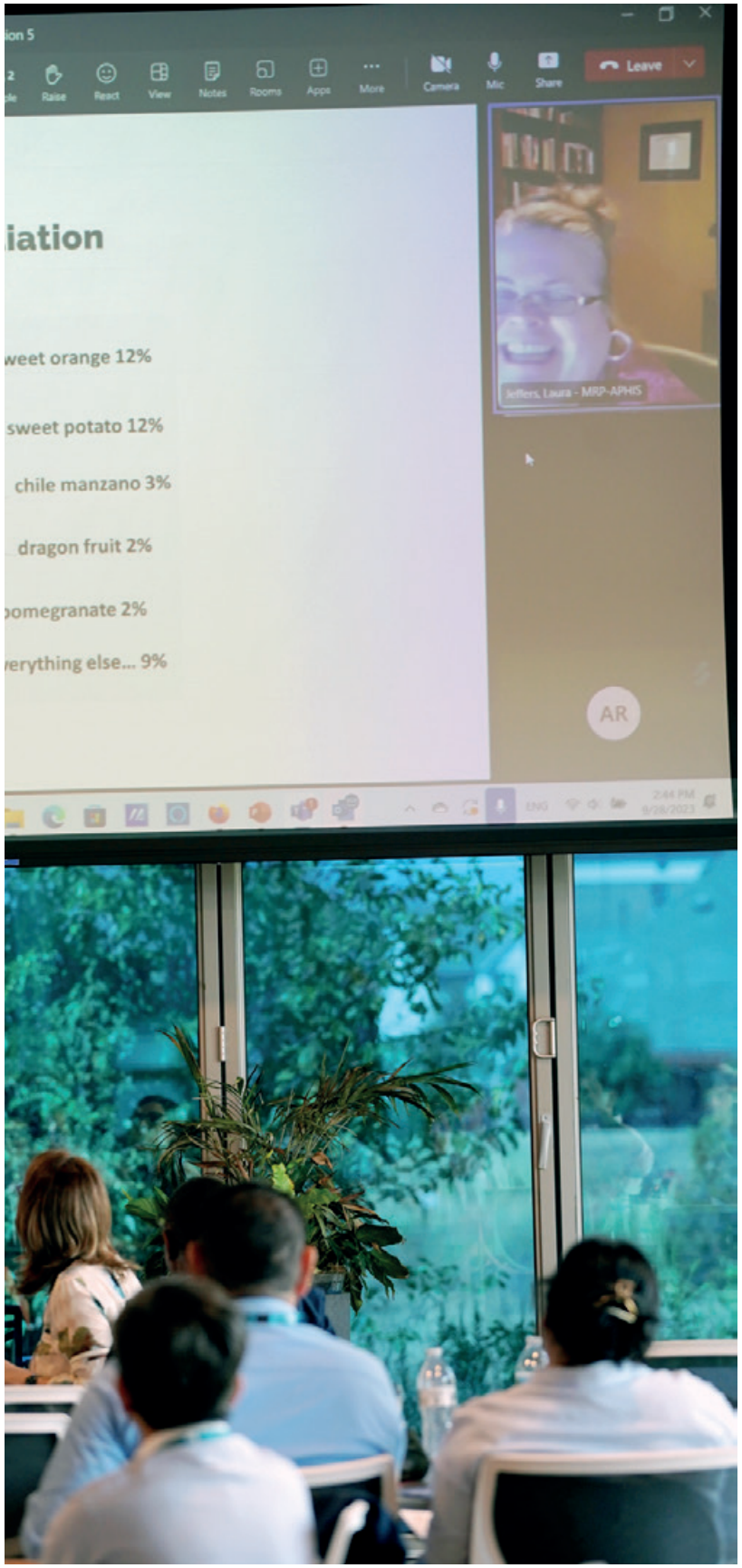
SESSION FOUR

THE JOURNEY TO GET A GOOD R&D PROJECT IN FOOD IRRADIATION





SESSION FIVE

HOW DO WE ACCELERATE THE ADOPTION OF THIS TECHNOLOGY GLOBALLY?


IFIS
Symposium


03:31:10
Chat
People
Raise
React
View
Notes
Rooms
Apps
More
Camera
Mic
Share
Hughes, Gabriel - MRP-APHIS
Search


Market access treatments
Comparison of end-point market access treatments
All phytosanitary treatments affect final fruit quality
Example of treatment
Air freight compatible
General
Acceptance of treatment
None
Additional packaging requirements
Yes
Maintenance of cold chain
No
Potential chemical residues
Medium
Relative cost of treatment
Availability of treatment
Registered grower and packing facilities
Effect on fruit quality
Potential impact – chilling injury
Overall comments
Potential chilling injury
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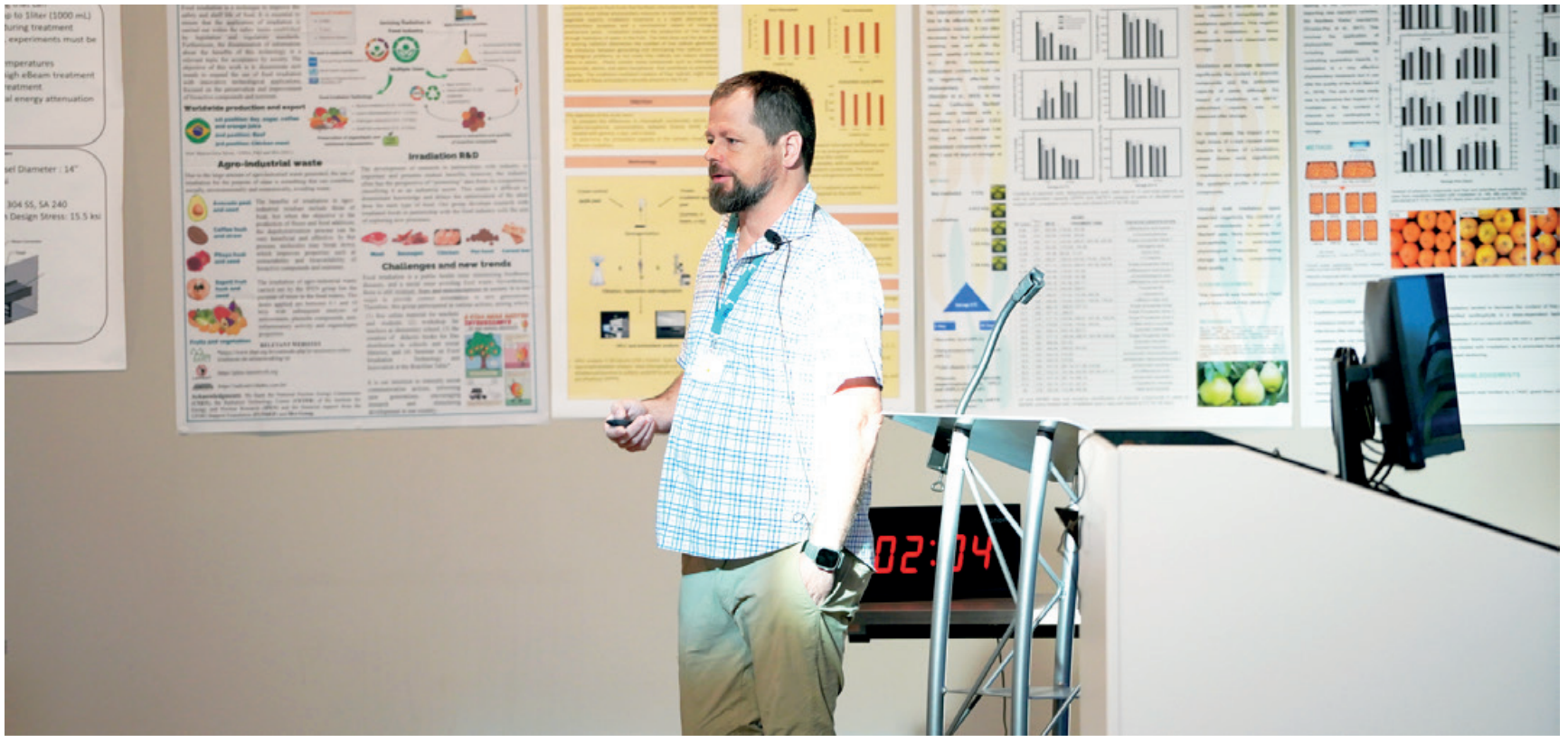
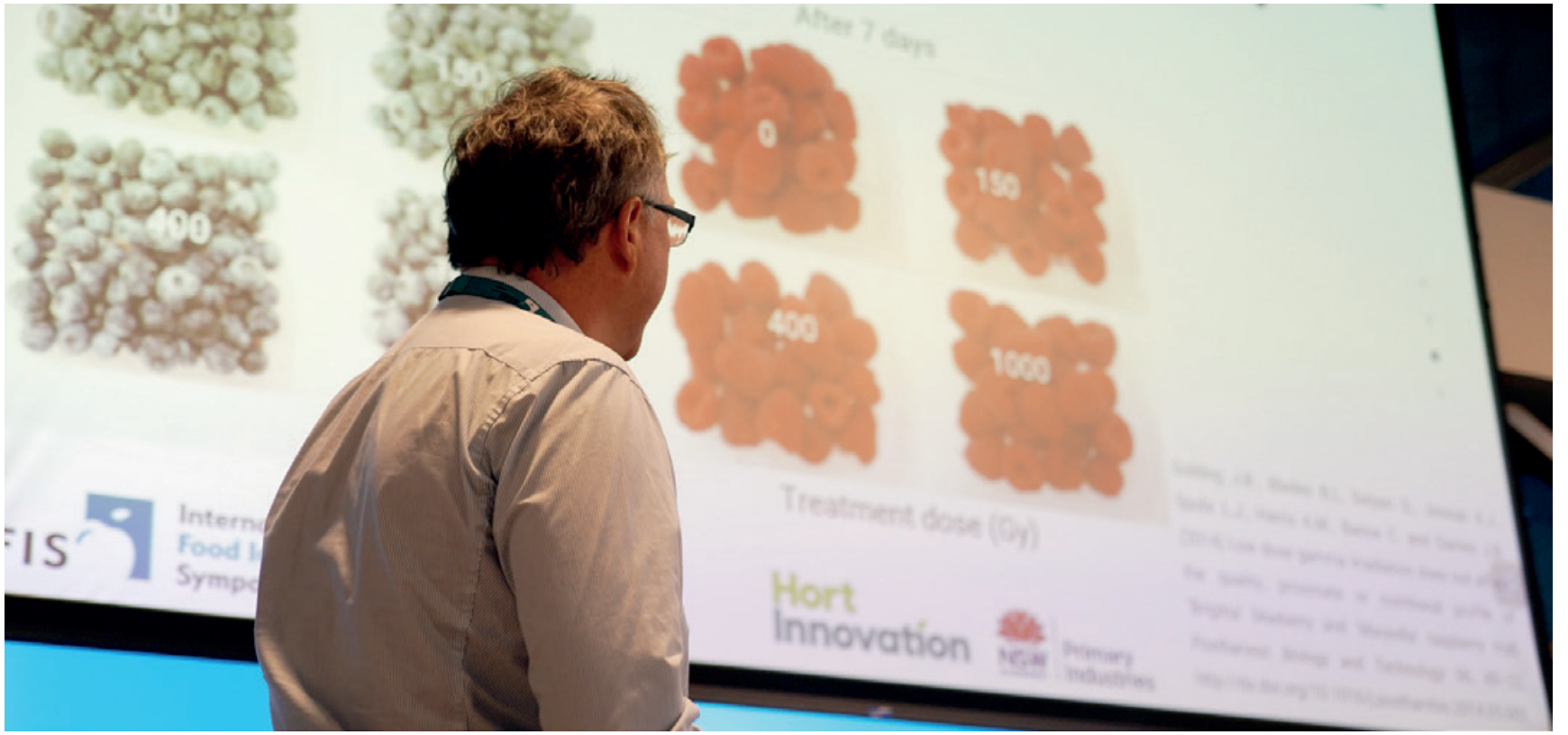

Agro-industrial waste
Irradiation R&D
Challenges and new trends
02:04


After 7 days
0
150
400
1000
Treatment dose (Gy)
Hort Innovation
NSW Primary Industries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Objectives
Methodology
Frozen irradiated apple peel
(Gamma, e-beam, x-ray)
Homogenization
Conclusion
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Andre Murray
Washington State University
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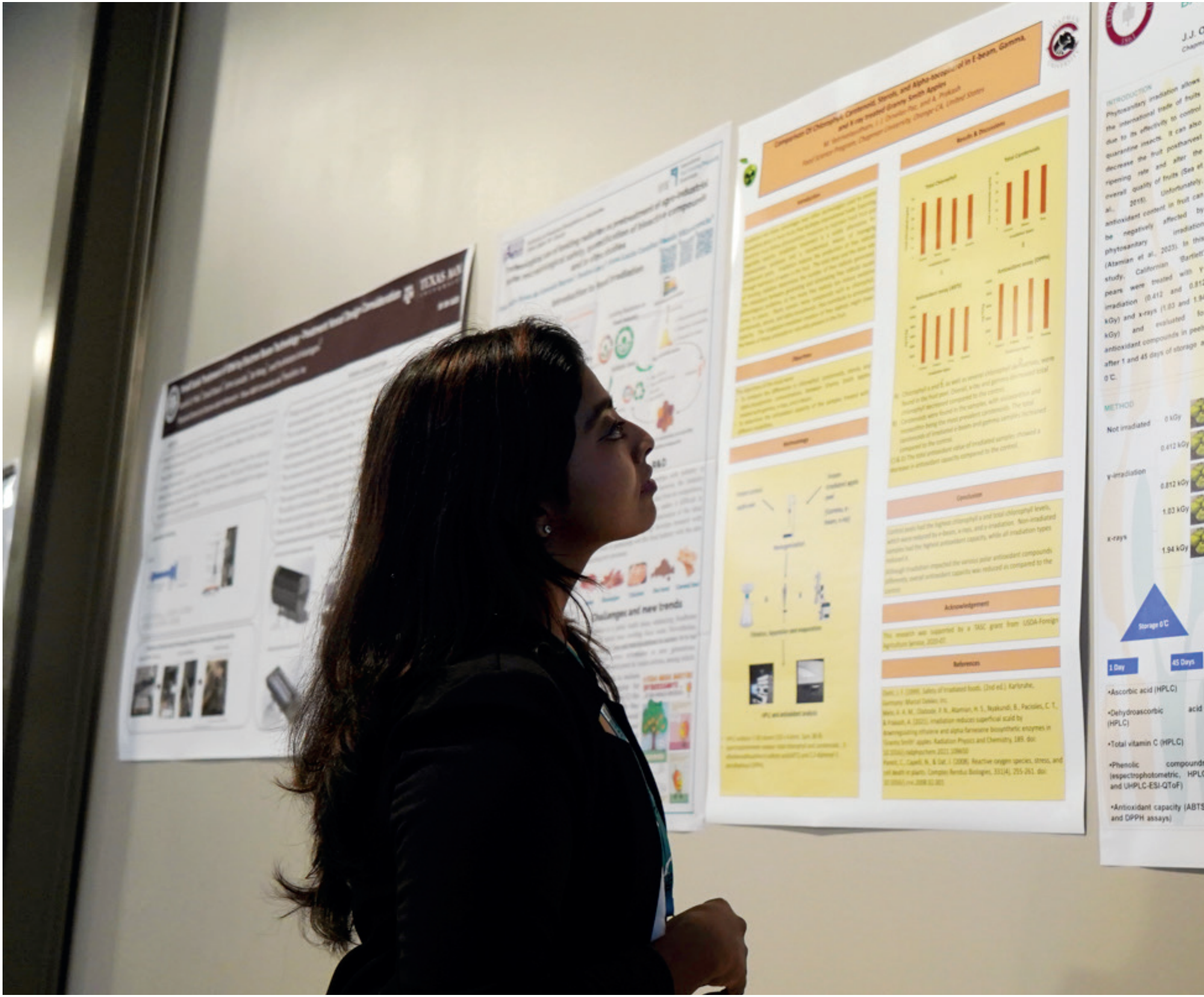
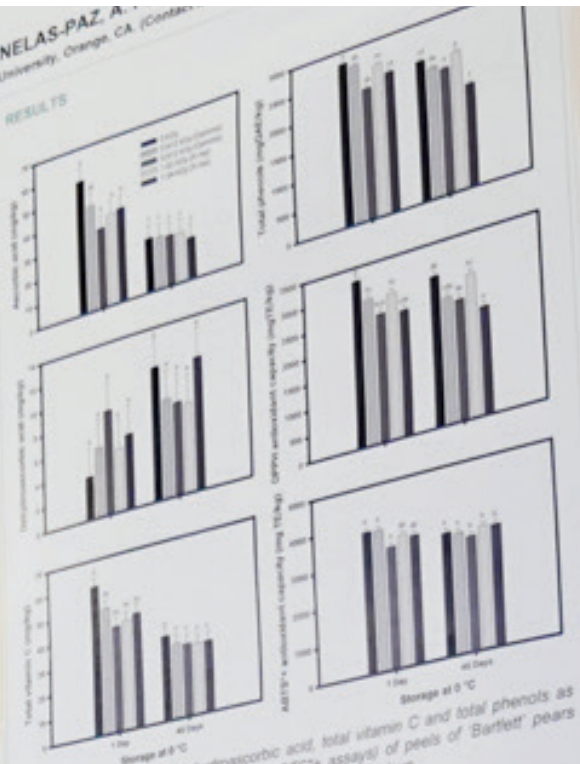

Results & Discussion
Conclusion
Acknowledgement
References
Not irradiated
0 kGy
0.412 kGy
γ-irradiation
0.812 kGy
1.03 kGy
x-rays
1.94 kGy
Storage 0°C
1 Day
45 Days
•Ascorbic acid (HPLC)
•Dehydroascorbic acid (HPLC)
•Total vitamin C (HPLC)
•Phenolic compounds (espectrophotometric, HPLC and UHPLC-ESI-QToF)
•Antioxidant capacity (ABTS and DPPH assays)

RESULTS



Contents of ascorbic acid, dehydroascorbic acid, total vitamin C and total phenols as well as antioxidant capacity (DPPH and ABTS•+ assays) of peels of 'Bartlett' pears treated with γ-irradiation and x-rays and stored at 0 °C for 45 days.

RT (min)	λ_{max} (nm)	[M-H]	MS/MS FRAGMENT IONS	TENTATIVE IDENTIFICATION
8.04	321	353.09	179.03, 191.06	Caffeoylquinic acid isomer 1
9.95	310	325.09	119.05, 163.04	p-Coumaroylhexose
10.28	282	577.13	125.02, 289.07, 407.08, 425.09	B-type procyanidin dimer 1
13.05	324	353.09	179.035, 191.06	chlorogenic acid
13.28	217	191.06	85.03, 111.01	Quinic acid
13.6	279	289.07	109.03,125.02,179.03, 245.08	(+)-Catechin
14.7	282	577.13	125.02, 289.07, 407.08, 425.09	B-type procyanidin dimer 2
15.08	322	353.09	179.03, 191.06	Caffeoylquinic acid isomer 2
16.4	279	337.09	173.05, 191.06	p-Coumaroylquinic acid
17.8	324	353.18	191.06, 307.17	Caffeoylquinic acid isomer 3
17.8	282	579.15	245.08, 289.07	Procyanidin B2
18.5	279	289.07	137.02, 151.04, 245.08	(−)-Epicatechin
19.6	328	295.05	115.00, 133.01, 135.05, 179.03	Caffeoyl-l-malic acid
19.9	282	865.19	289.07, 577.13	B-type procyanidin trimer
23.1	282	577.13	289.07	B-type Procyanidin dimer 3
23.9	279	577.13	125.02, 289.07, 407.08, 425.09	B-type Procyanidin dimer 4
24.8	279	279.05	115.00, 119.05, 163.04	D-Malic acid p-coumarate
28.8	352	609.14	503.19, 563.21	Quercetin rutinoside
29.2	283	577.13	245.04, 289.07, 407.08, 425.09	B-type Procyanidin dimer 5
29.9	352	463.09	301.03	Quercetin hexoside 1
30.6	352	463.09	300.03, 301.03	Quercetin hexoside 2
33.5	354	623.18	315.05	Isorhamnetin rhamnosylhexoside 1
33.8	354	623.18	315.05	Isorhamnetin rhamnosylhexoside 2
34.2	354	477.10	267.16, 271.06, 314.04	Isorhamnetin hexoside 1
34.9	327	515.12	191.06, 353.09, 447.09, 477.10	di-Caffeoylquinic acid
35.5	353	477.10	267.16, 269.18	Isorhamnetin-hexoside 2
37.8	279	451.10	217.01, 341.07	(-)-Epicatechin hexoside
38	278	331.04	112.99, 283.26	Gallic acid hexoside

UV and MS/MS data and tentative identification of phenolic compounds in peels of Bartlett' pears treated with γ-irradiation and x-rays and stored at 0 C for 45 days.

effect of irradiation ... compounds was not observed ... storage.

•Irradiation and storage decreased significantly the content of phenolic compounds and the antioxidant capacity of peels, although the impact of irradiation on ABTS•+ antioxidant capacity was not observed after storage.

•In some cases, the impact of the high doses of x-rays caused similar impacts to those of γ-irradiation, whose doses were significantly lower.

• Irradiation and storage did not alter the qualitative profile of phenolic compounds.

•Overall, both irradiation types impacted negatively the content of polar antioxidants in peels of 'Bartlett' pear, likely increasing their susceptibility to post-harvest physiological disorders during storage and thus, compromising their quality.

ACKNOWLEDGEMENTS

This research was funded by a TASC grant from USDA-FAS (2020-07).

REFERENCES

Sea, S., Rakovski, C., Prakash, A., 2015. Ripening quality of 'Bartlett' pears (Pyrus communis L.) subjected to phytosanitary x-ray irradiation treatment followed by simulated retail display. HortScience, 50(2):279–287.

Atamian, H.S., Loeyza-Davila F.E., Prakash, A., 2023. A transcriptomic study of 'Granny Smith' apple fruit response to x-ray irradiation using RNA-Seq. Scientia Horticulturae, 311, 111777.

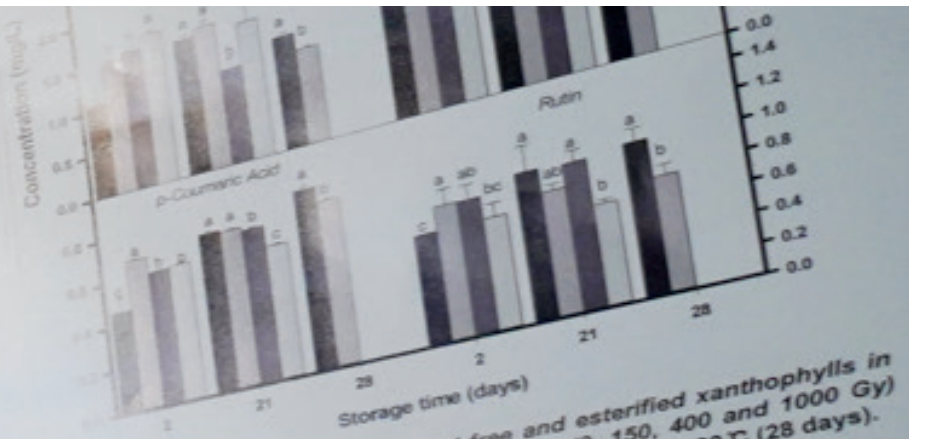
controlling ... Irradiation is a ... phytosanitary treatment but it ... alter the quality of the fruit (Ham et al., 2019). The aim of this study was to determine the impact of γ-irradiation on the content of phenols and ... Seedless 'Kishu' ... storage.

METHOD

•Overall quality (appearance, firmness, titratable acidity and total soluble solids)

•Phenolic compounds (HPLC, spectrophotometry)

•Xanthophylls (HPLC-MS (LC-DAD-APCI+-ToF)



Content of phenolic compounds and free and esterified xanthophylls in juice from mandarins treated with irradiation (0, 150, 400 and 1000 Gy) and stored at 5 °C for 3 weeks (21 days) plus one week at 20 °C (28 days).

Appearance of irradiated Seedless 'Kishu' mandarins after 3 weeks (

CONCLUSIONS

- Irradiation caused peel darkening.
- Irradiation-induced peel damage led to fungal infections after storage at 20 °C for 1 week.
- Irradiation did not influence total soluble solids and titratable acidity.
- Irradiation caused a dose-dependent increase in the content of total phenolic compounds and most individual phenols immediately after irradiation application.
- Overall, irradiated fruit contained less phenols than control fruit after cold storage.

•Irradiation tended to decrease ... esterified xanthophylls in a d... independent of carotenoid ester...

• Seedless 'Kishu' mandarins ... to be treated with irradiation, ... and peel darkening.

ACKNOWLEDGEME...

This research was funded ... FAS.


antioxidant compounds in peels
after 1 and 45 days of storage at
0 ℃.
METHOD
Not irradiated
0 kGy
0.412 kGy
γ-irradiation
0.812 kGy
1.03 kGy
x-rays
1.94 kGy
Storage 0 ℃
45 Days
impacts to those of γ-irradiation,
whose doses were significantly
lower.
• Irradiation and storage did not alter
the qualitative profile of phenolic
compounds.
TENTATIVE IDENTIFICATION
METHOD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iba · Aerial · Texas A&M AgriLife Research · Wegmans · FAO IAEA Joint FAO/IAEA Centre · REVEAM · STERITECH Protecting what matters · Benebión · Gateway America · SteriTek · National Center for Electron Beam Research