2023 PECAN PROCESING RESEARCH WORKSHOP

Research Update and Feedback Session

August 8th 9 am – 10:30am

UNIVERSITY OF GEORGIA

University of Georgia College of Engineering

Research Update

USDA United States Department of Agriculture

College of Engineering UNIVERSITY OF GEORGIA

NPSA NATIONAL PECAN SHELLERS ASSOCIATION

I LOVE pecans

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Moisture

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Introduction

"Moisturizing pecans improves cracking efficiency by softening shells, enhancing flexibility, and increasing usable meat yield, reducing waste and maximizing pecan extraction."

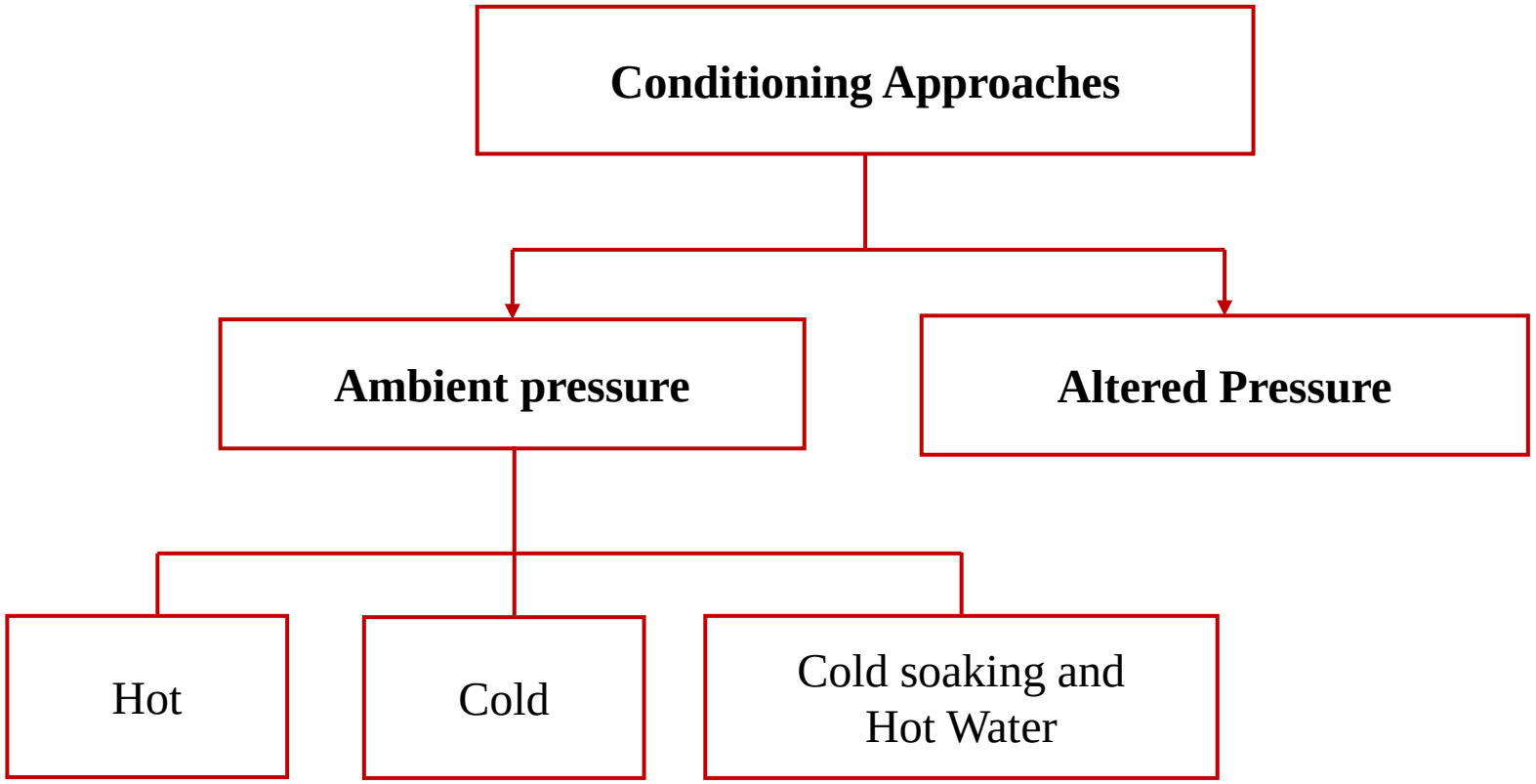
Research Objective

Developing a predictive model for moisture content using factors such as *time*, *temperature*, and other relevant variables

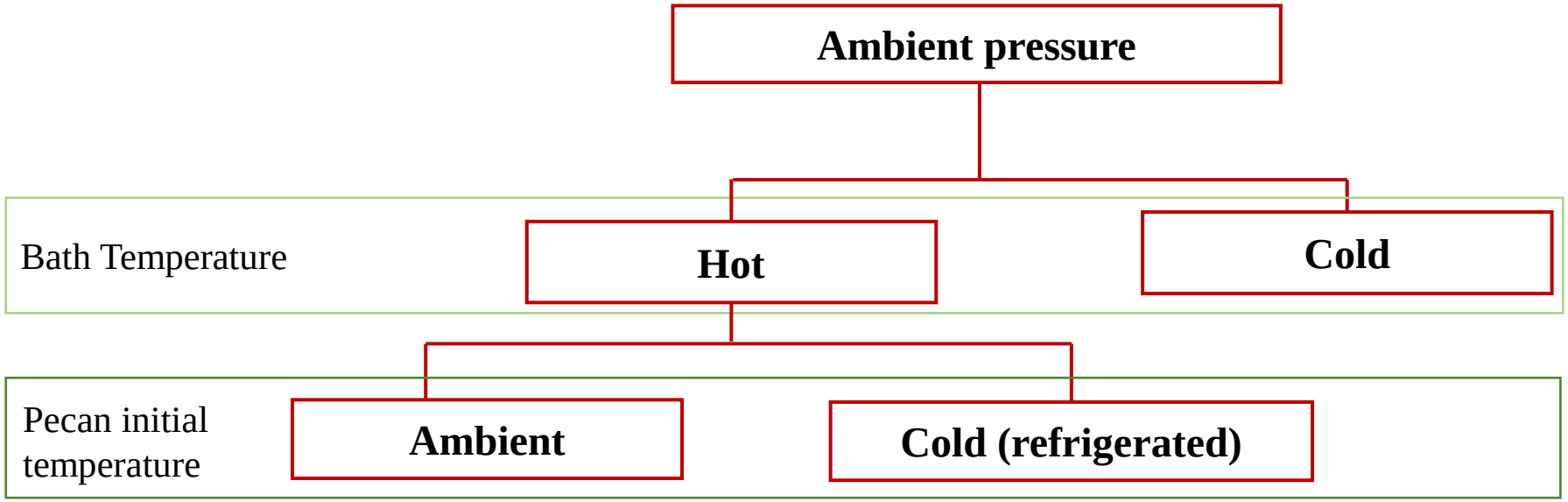
Research Questions

1. What are the relevant moisturization variables that impact kernel and shell moisture content?
2. What are the effects of the aforementioned variables (i.e., *time*, *bath temperature*, *pressure*) on shell and kernel moisture content?
3. What is the correlation between kernel and shell moisture content?

Experimentation



Experimentation



Design of Experiment

Hot

	Factor	Measurement	Range	
			Min	Max
Input Variable	*Time*	Minute	3	20
	Temperature	F	180	207
Output Variable	*Moisture content*	%	TBD	

Cold

	Factor	Measurement	Range	
			Min	Max
Input Variable	*Time*	Hours	15	20
	Temperature	F	50	70
Output Variable	*Moisture content*	%	TBD	

Equipment

- Equipment: Cooker
- Purpose: Setting the water temperature to the desired level

Fig1.

- Equipment: Refrigerator
- Purpose: Storage and cooling system

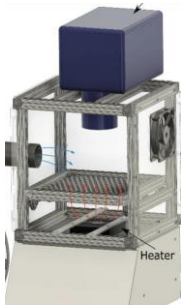
Fig2.

- Equipment: SB900
- Purpose: Measuring the Moisture

Fig3.

- Equipment: Aqualab 3
- Purpose: Measuring the Moisture

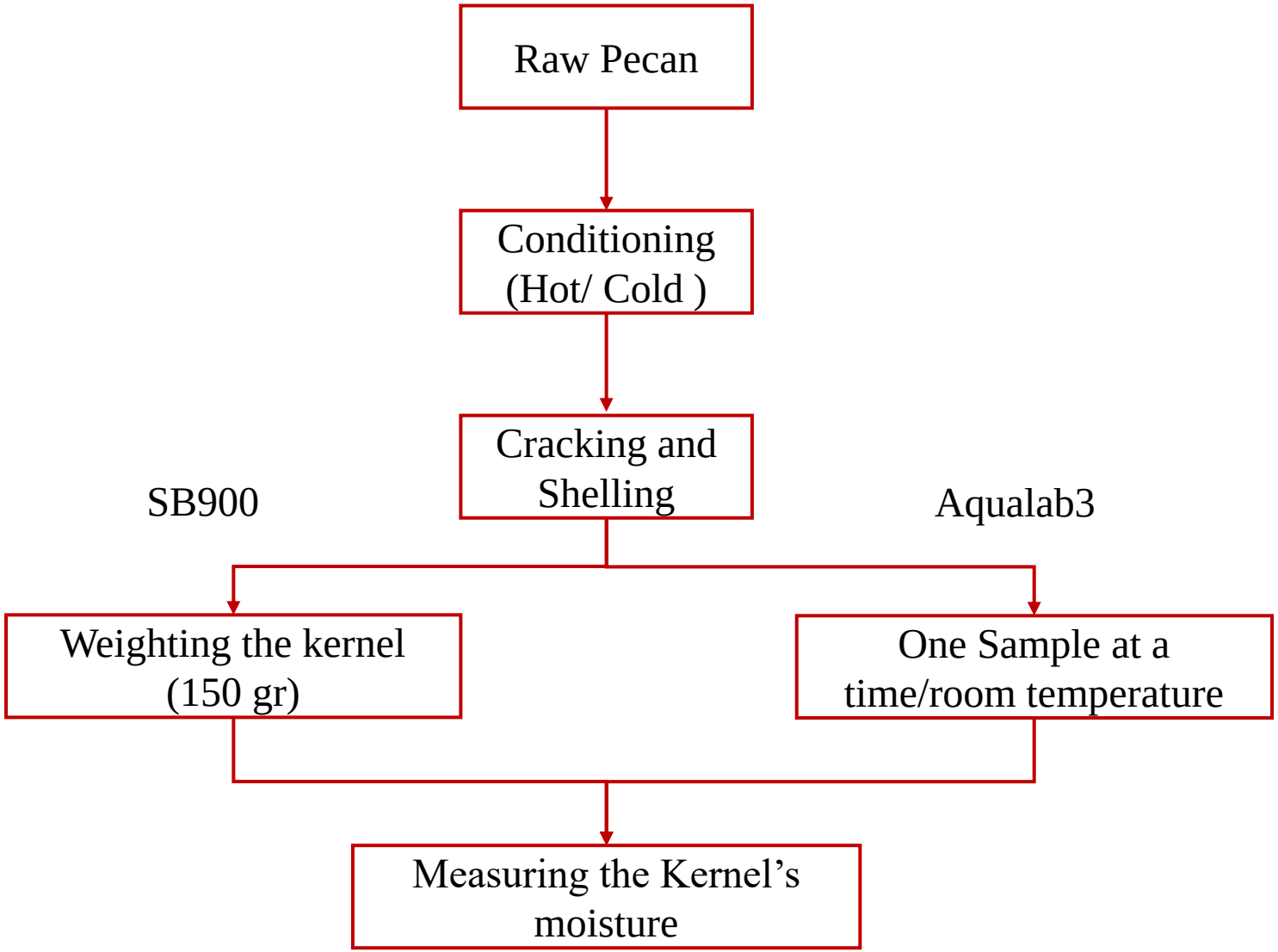
Fig4.



- Equipment: IR3000
- Purpose: Measuring the Moisture

Fig5.

Process


Raw Pecan
Conditioning (Hot/ Cold)
Cracking and Shelling
SB900
Aqualab3
Weighting the kernel (150 gr)
One Sample at a time/room temperature
Measuring the Kernel's moisture

Short Demo

Preliminary Data and Results

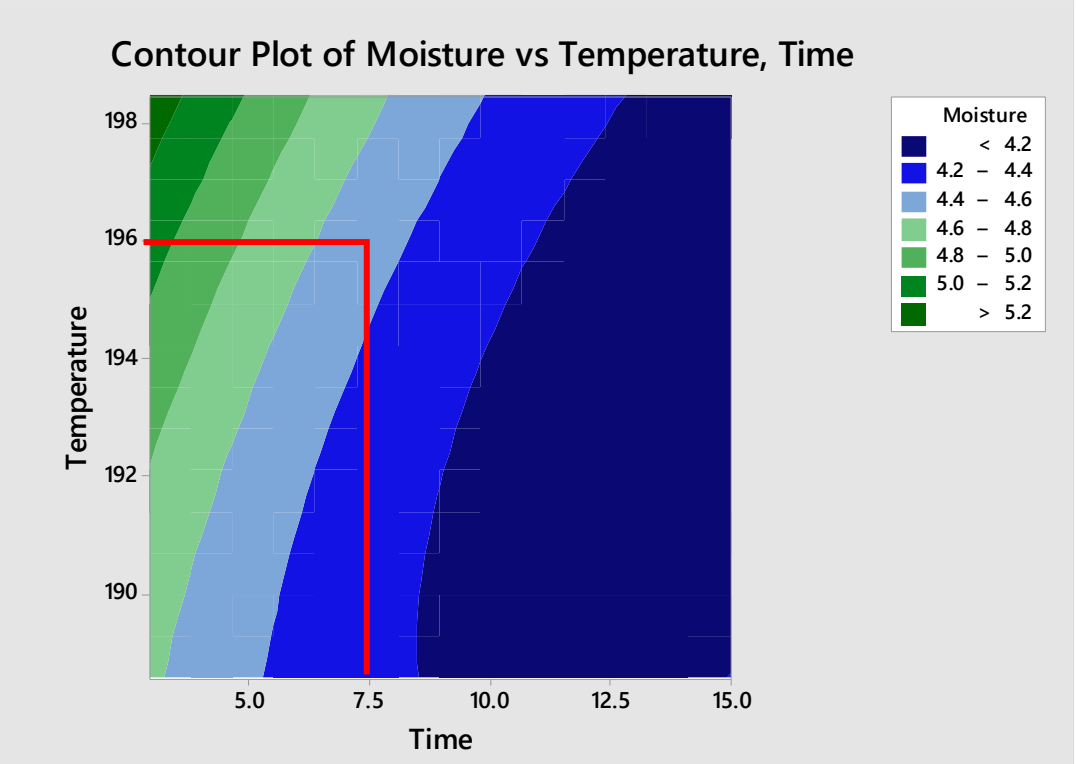


Fig 5. Contour plot – conditioning the pecans that are in the room temperature

Preliminary Data and Results

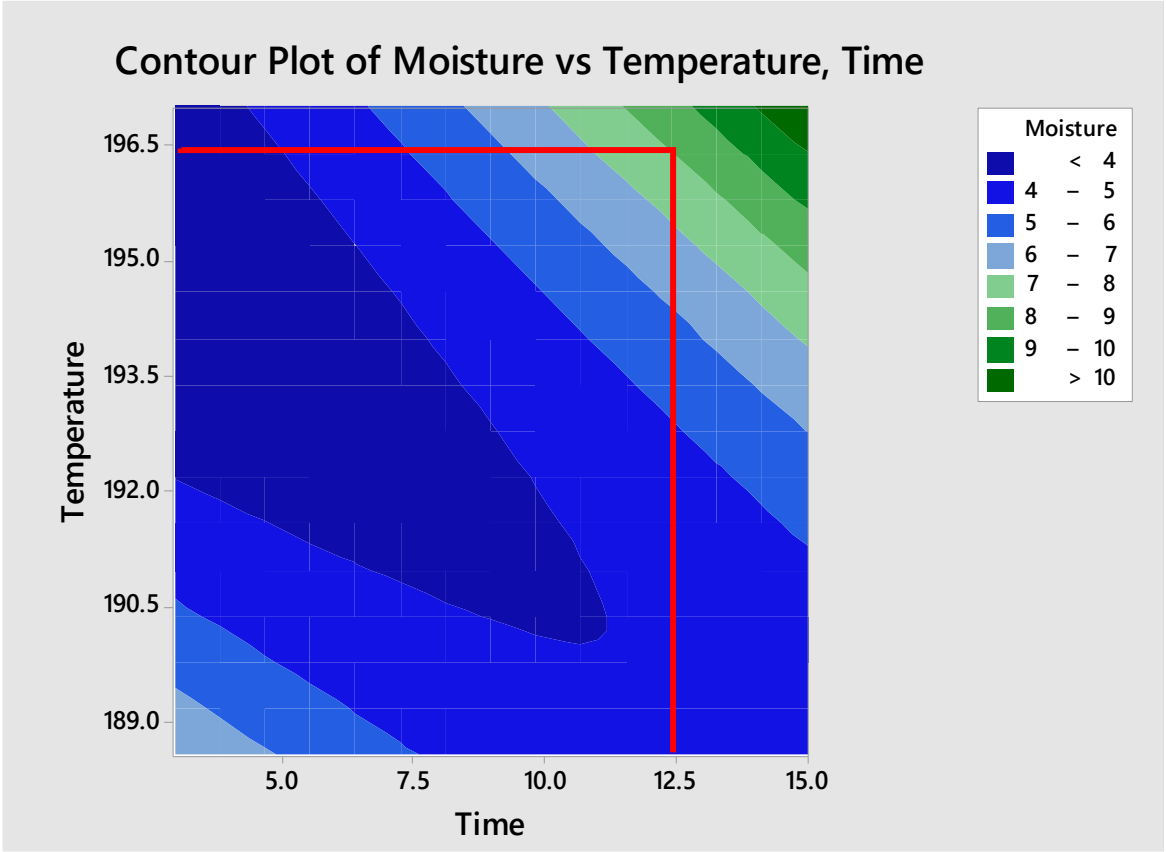


Fig 6. Contour plot – conditioning the pecans that are out of fridge for 30 minutes

Preliminary Data and Results

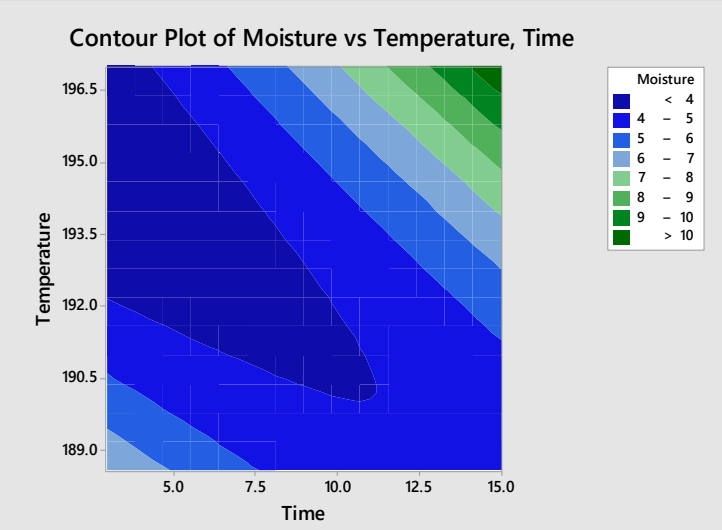
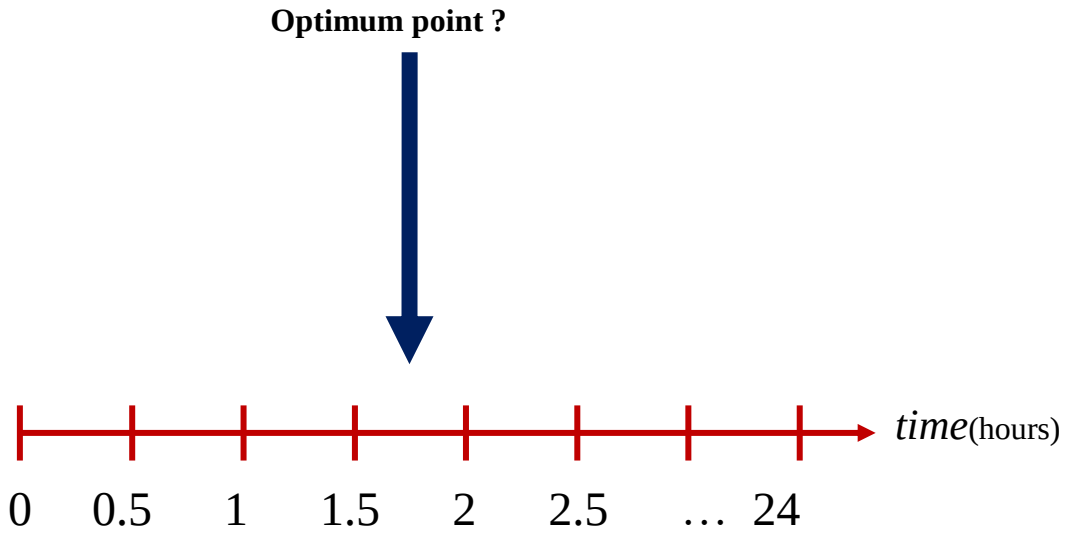


Fig 6. Contour plot – conditioning the pecans that are out of **fridge for 30 minutes**



Preliminary Data and Results

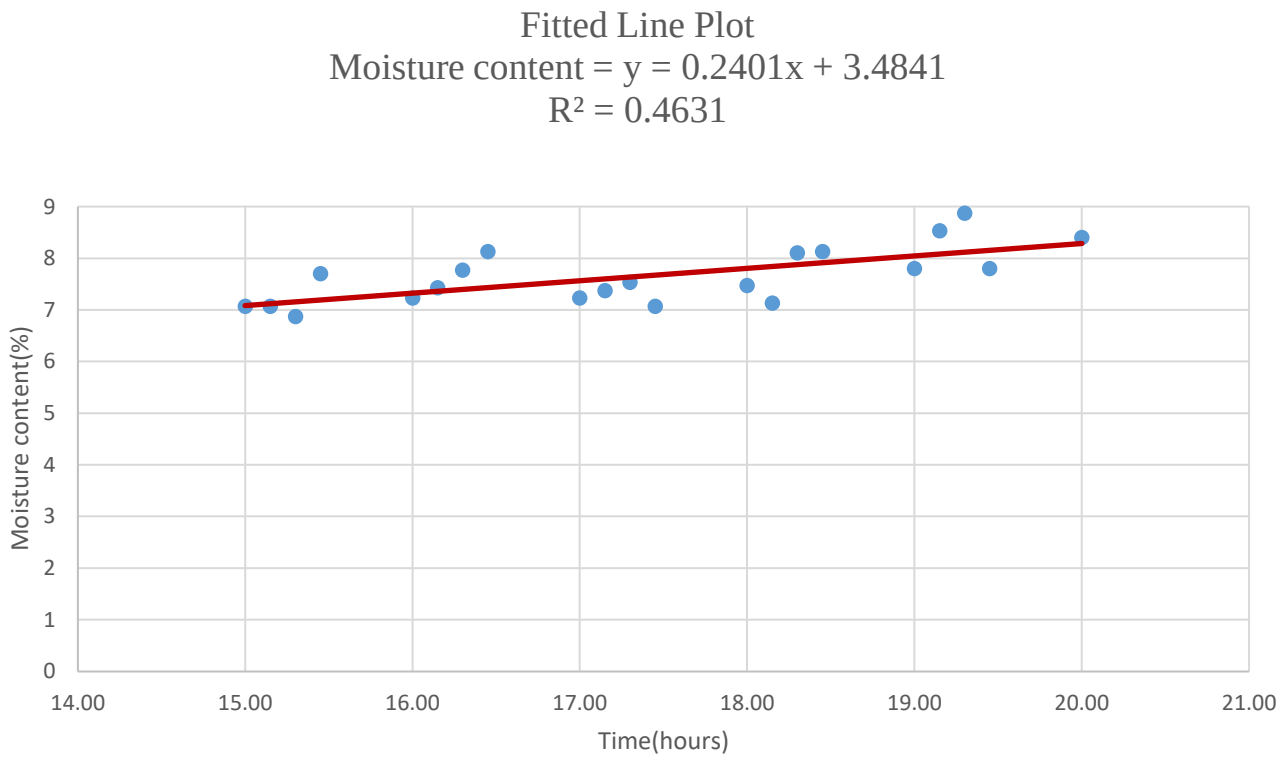


Fig 7. Cold soaking for 15 to 20 hours

Takeaways

- In hot bath, among all factors (*time* and *temperature*),
  time is more important and effective than *temperature* in absorbing moisture.
- In hot bath, initial pecans *temperature* (before conditioning) has a significant role and impact on absorbing moisture
- In general, cold soaking shows a positive moisture to *time* relationship

Summary of Accomplishment

- Modifying, calibrating and purchasing equipment
- Contacting industry to verify the process
- Collecting experimental data
- Consider new approaches

Future Work (What we will do this upcoming year…)

- Finding new condition methods (new input,…)
- Improve accuracy of results to scale up
- Impact of initial temperature on moisture absorption
- Study Shell and Kernel correlation