

Evaluation of processing aids for olive oil extraction and quality improvement

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Development Corporation**

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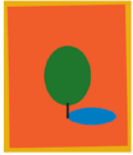
Processing aids & techniques

Traditional aids

Talc powder
Enzymes
Water

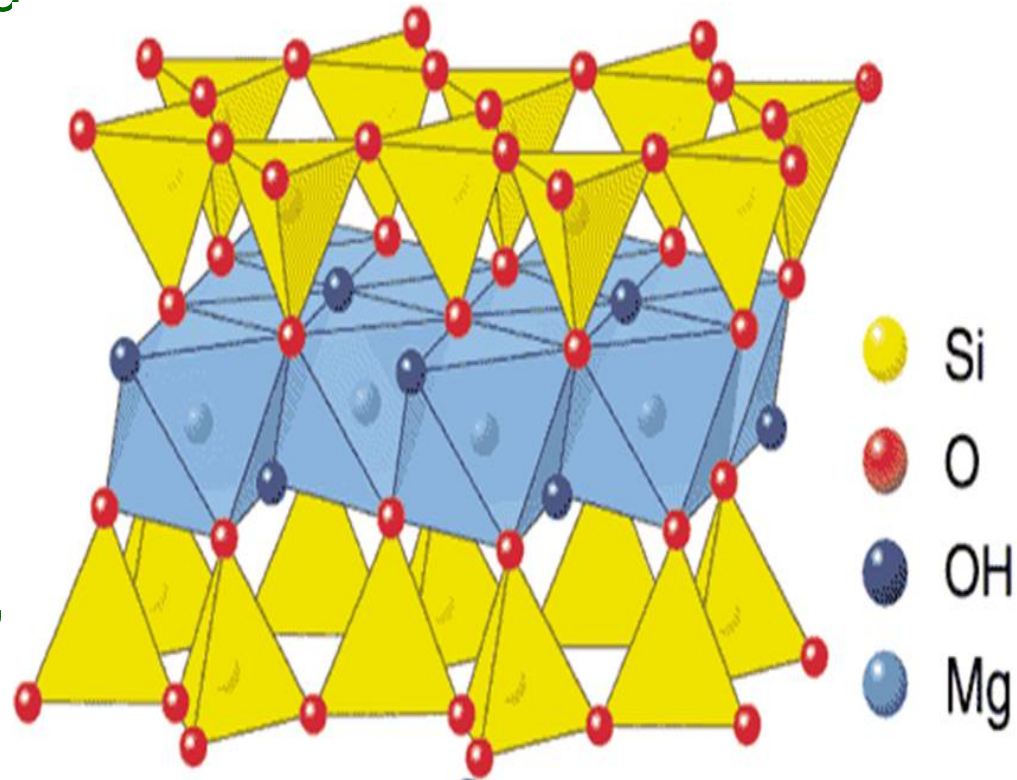
New aids

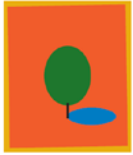
Microtalc powder
Common salt
Calcium carbonate
Enzymes with side activities
Warm water dipping
Ultrasound



Talc & microtalc powder

- Natural mineral (hydrated magnesium silicate) of laminar structure
- Provokes aggregation of particles and provides structure to the olive paste in the malaxer
- Essential with high moisture fruit or “difficult” pastes





Talc & microtalc powder

Talc powder

- Oldest powder used in the industry
- Magnesium silicate with high adsorption surface
- $d_{50\%} = 8\mu\text{m}$
- Specific surface area = $3.6 \text{ m}^2/\text{gr}$
- Dose = 0.5-3%

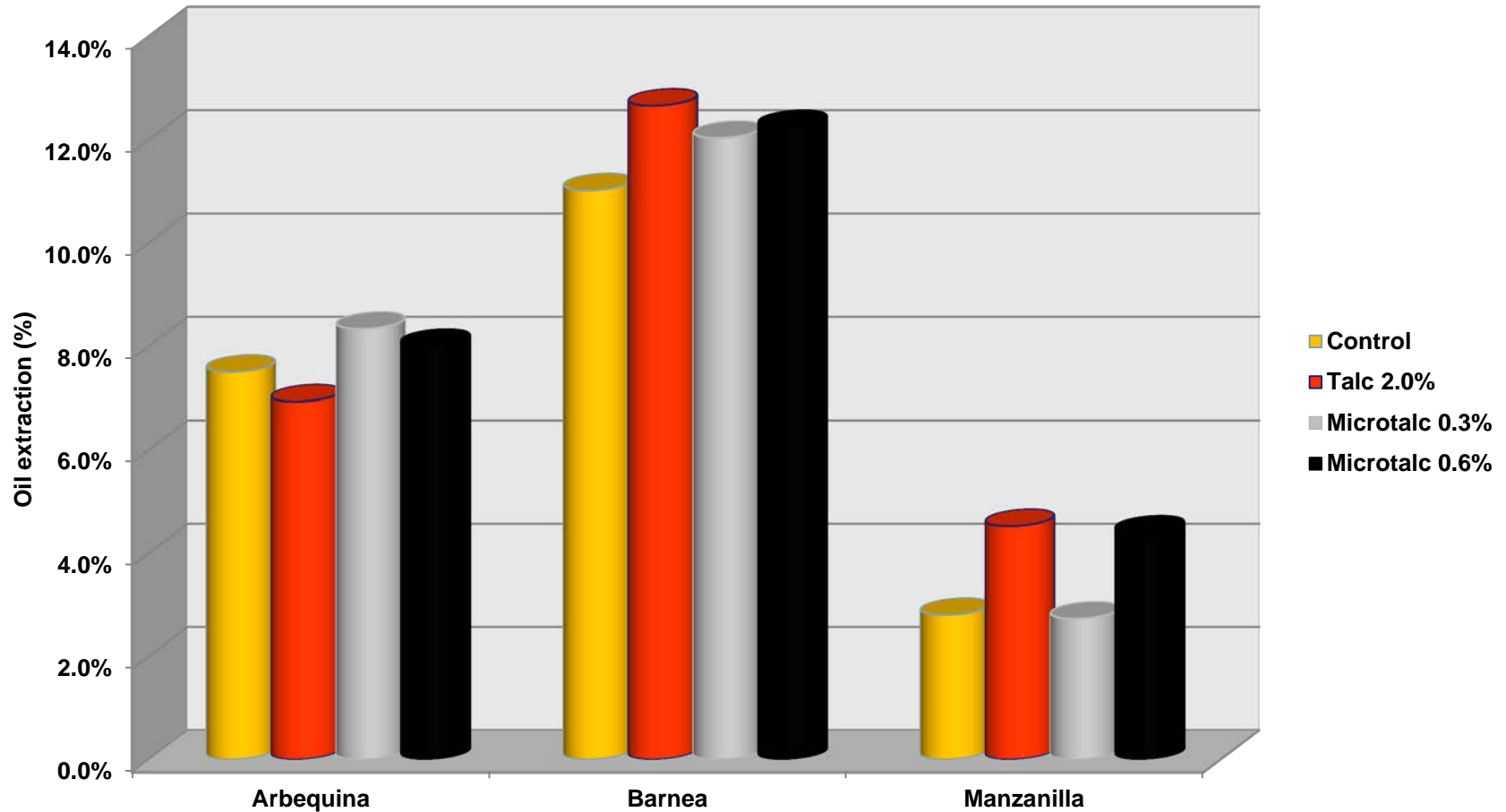
Microtalc powder

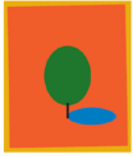
- New product in the industry
- Same as talc powder, but finer particle size
- $d_{50\%} = 2\mu\text{m}$
- Specific surface area = $7.0 \text{ m}^2/\text{gr}$
- Dose = 0.3-1%





Talc & microtalc powder

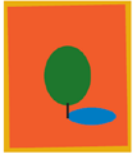




Talc & microtalc powder

- Beneficial impact on FFA, PV, K232, K270 & ΔK in Arbequina, Barnea & Manzanilla
- Higher PPH content in Barnea & Manzanilla
- No impact on taste or colour
- Microtalc powder is more cost effective than talc due to less product transport, handling & storage

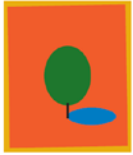




Common Salt (NaCl)

- High solubility in water. It does not make the oil “salty”
- Action: It changes the density of the water stretching out the gap of water:oil densities
- Greener oils as it increases chlorophyll solubility
- Dose = 1-3%
- Significantly cheaper than talc & microtalc powder

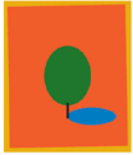




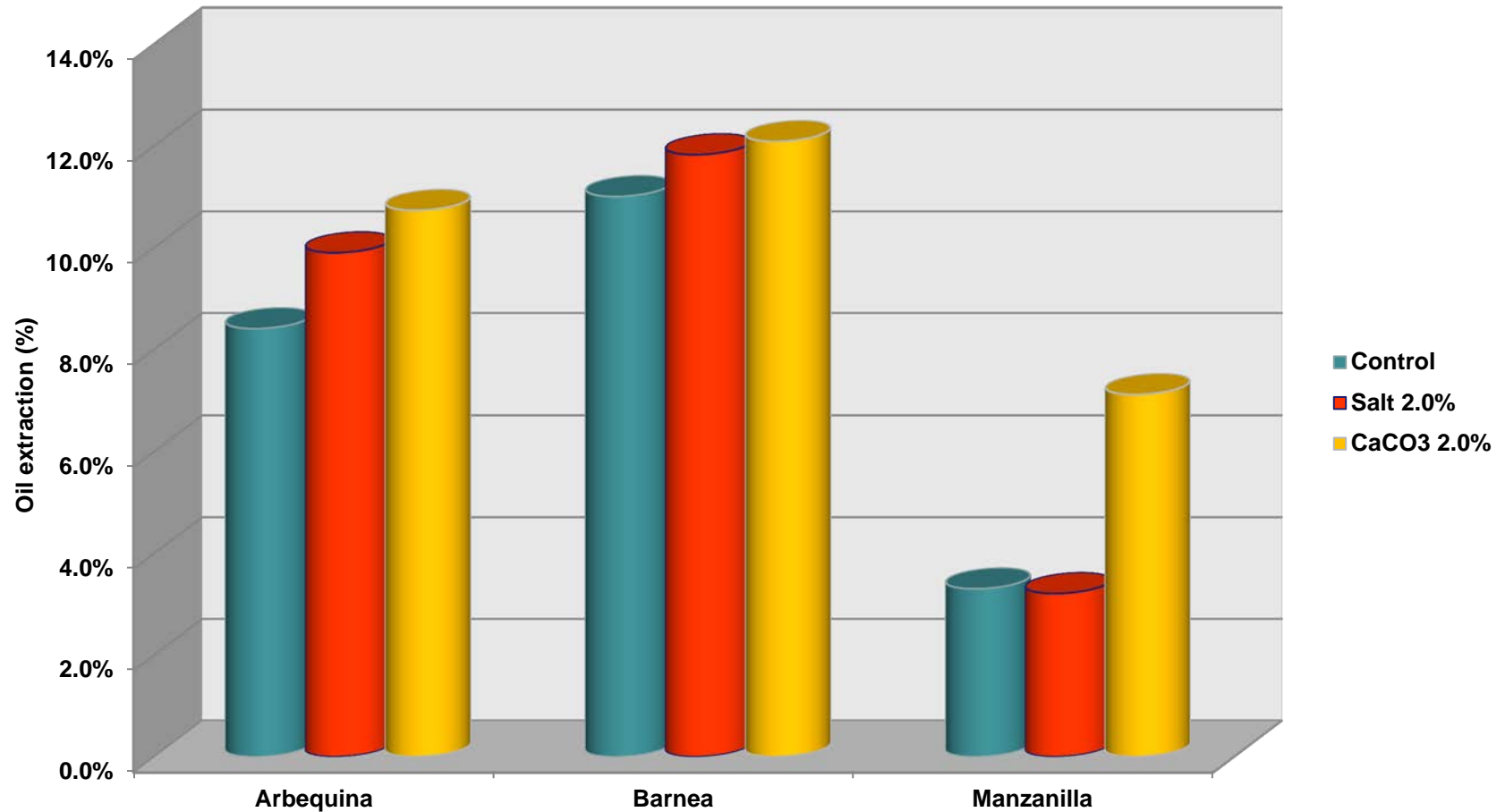
Calcium carbonate

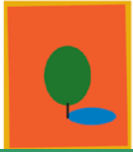
- Natural mineral with crystalline structure (calcite)
- It facilitates flocks agglomeration by adsorption (similar action to Talc powder)
- $d_{50\%} = 2.8\mu\text{m}$
- Density = 2.7 gr/ml
- Dose = 1-2%
- Cheaper than Talc powder
- Used in Spain with excellent extraction efficiency results





Salt & Calcium carbonate





Salt & Calcium carbonate

Salt (NaCl)

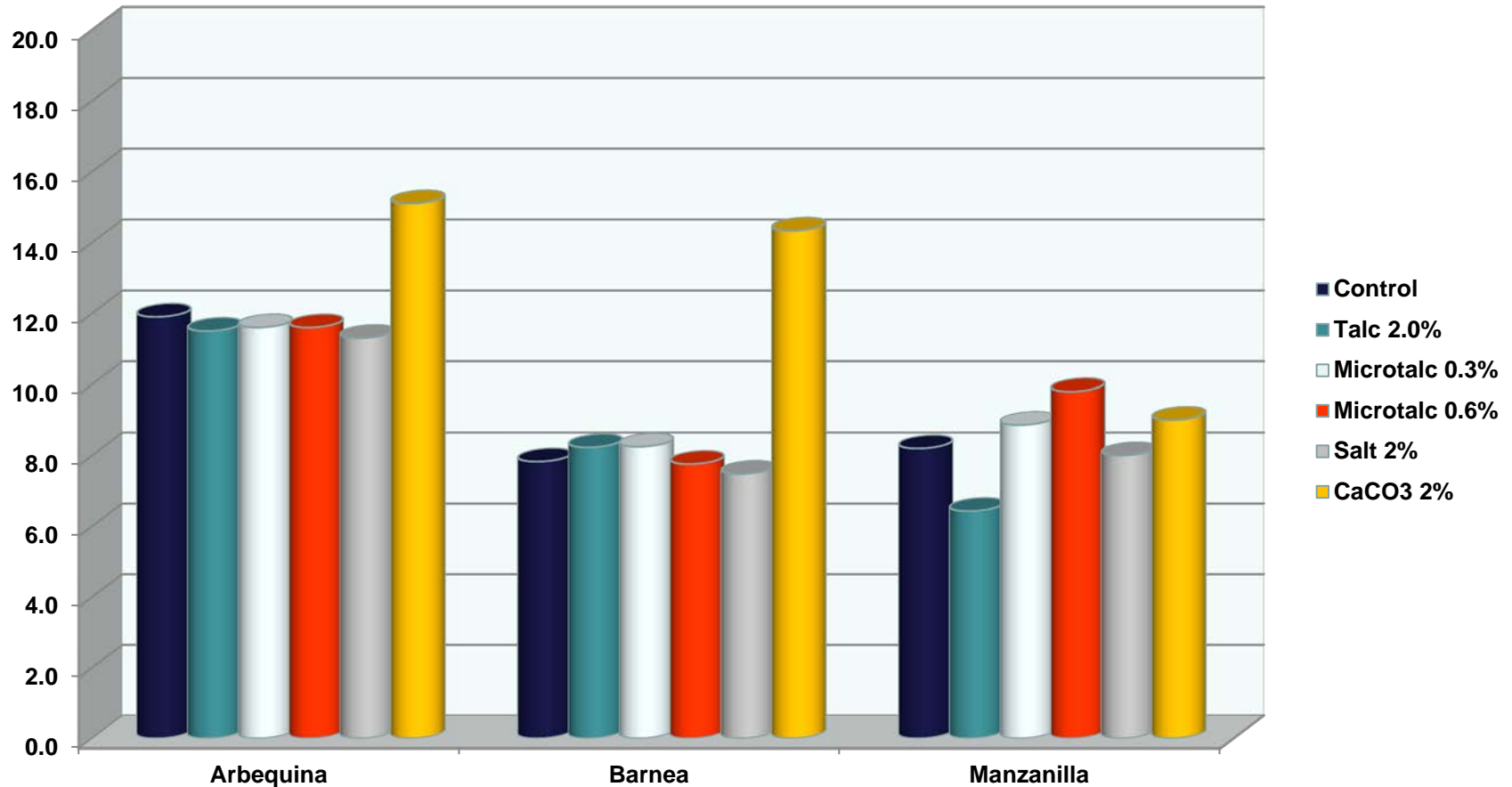
- Improves extractability
- No impact on taste
- Slightly greener oils
- Higher PPH content in oil and slightly higher stability
- Environmental concerns over CE and Na content of pomace

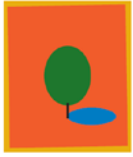
Calcium carbonate

- Aggressive on paste
- Very high extractability
- Reduces FFA
- Oxidative action (PV, UV)
- ↓↓ PPH, stability & bitterness
- Very green oils
- Changes in taste

Salt & Calcium carbonate

Peroxide value





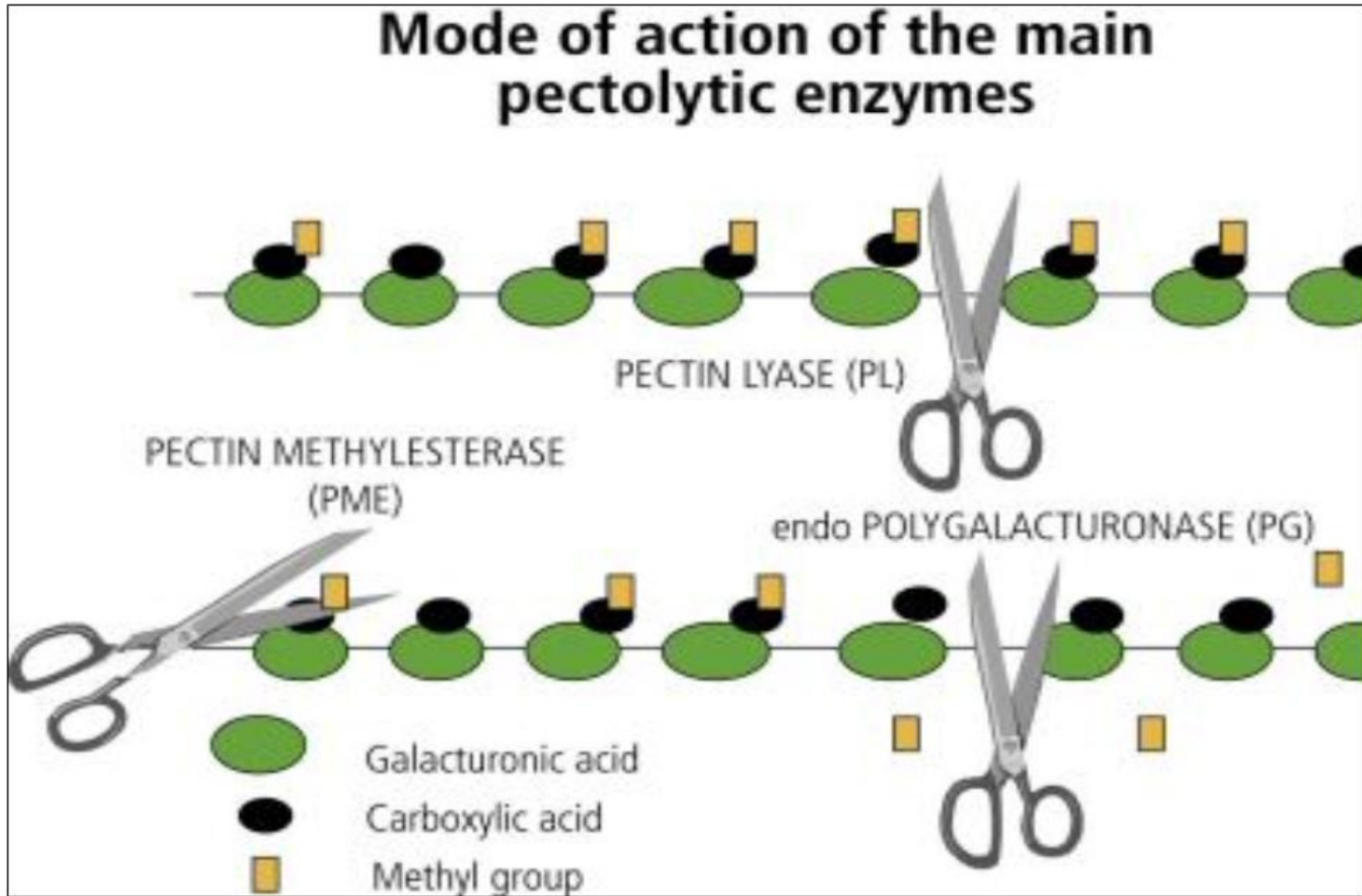
Enzymes

- Very effective in improving the paste extractability
- Biologically active protein substances that help in degrading the pectin & cellulose of the cell walls & vacuoles
- Same enzymes that the fruit has in its tissues
- Endogenous enzyme system depends on the season, variety & maturity and is inactivated by polyphenols
- Dose = Variable (200-500ml/tn). Higher in dry years
- Water soluble and easily removed by centrifugation
- Absolutely essential when dealing with low maturity fruit





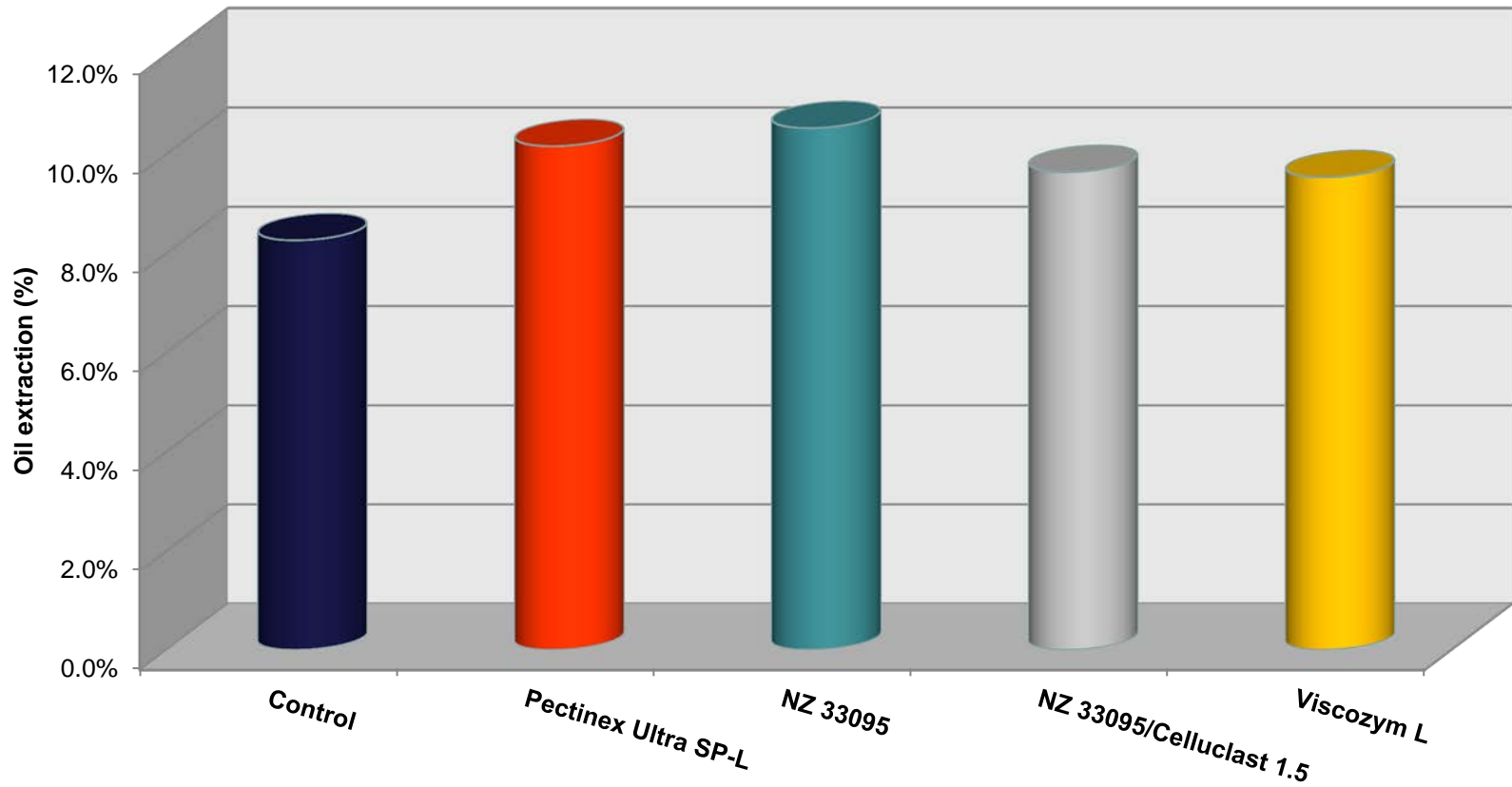
Enzymes

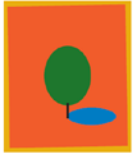




Enzymes

Arbequina

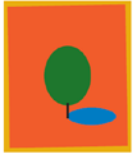




Enzymes

- Very goof results in Arbequina. It was not a solution for high moisture Manzanilla without talc powder
- No alteration of oil quality for better or worse
- No changes in taste and colour
- Best performing enzymes: NZ 33095 & Pectinex Ultra
- The key seems to be: High PG/PE/PL activity with average side activities
- Field trials better than laboratory trials. Abencor limitations

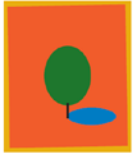




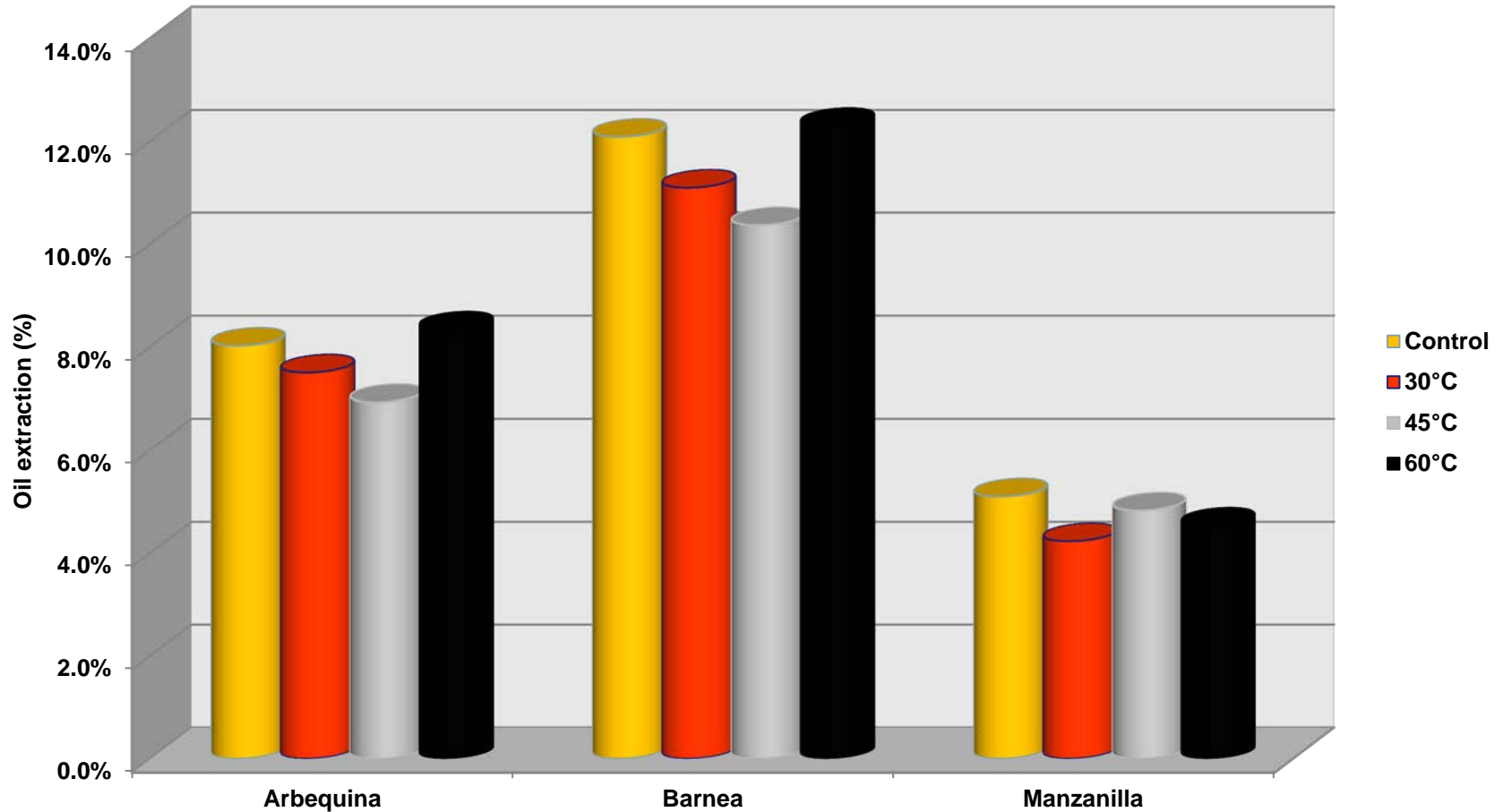
Warm water dipping

- It consists of pre-heating olives before crushing to achieve a higher temperature at beginning of malaxing
- Technique: Immersion of olives for 3 minutes in warm water at 30-45-60°C
- Research works in Spain indicate that dipping:
 1. Increases paste extractability
 2. Reduces bitterness
 3. Inhibits LOX enzyme → Delays oil oxidation
 4. Increases chlorophyll content → Greener oils
 5. No changes in taste





Warm water dipping

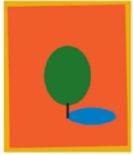




Warm water dipping

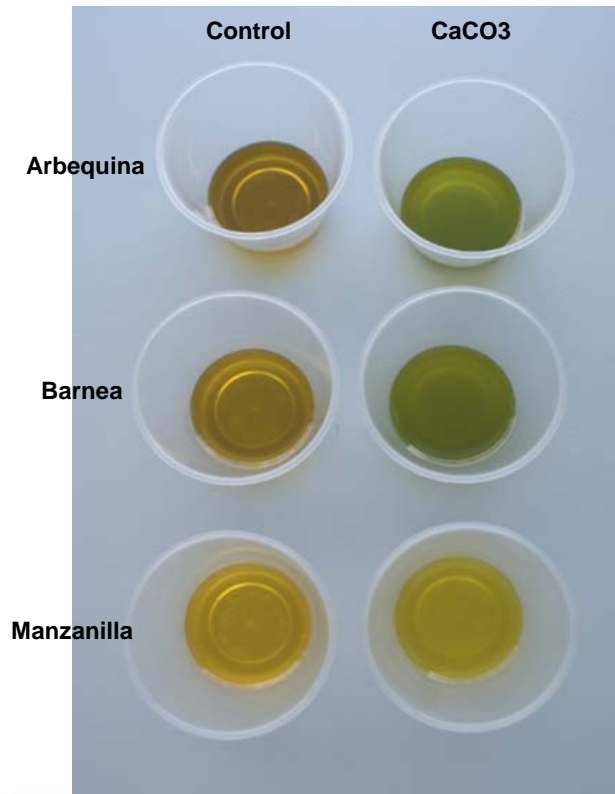
- Simple to implement in small Plants working in “batching” modality. More complicated for larger Plants
- Paste extractability showed slight improvements only at 60°C
- Increase in the moisture content of the fruit, making the extraction process more difficult
- Combined with talc could be interesting
- Oils are greener, but there is a change in taste too
- There is a clear reduction of the bitterness
- There is a reduction of the oxidative stability



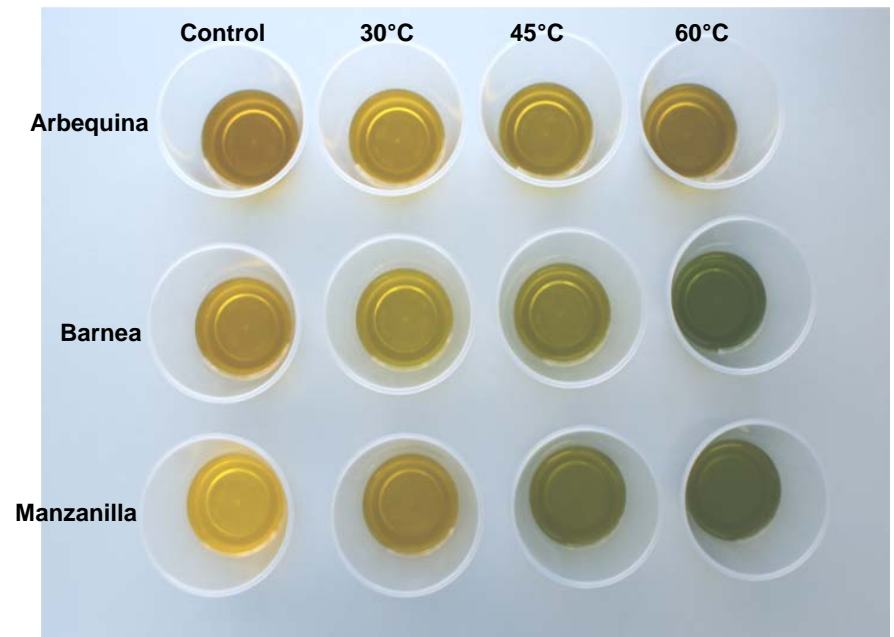


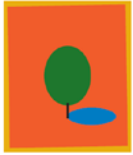
Colour changes

Calcium carbonate



Warm water dipping





Ultrasound

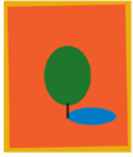
Enhancing Olive Oil Processing Efficiency and Competitiveness Using UltraSound Technology

Research project funded by HAL

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Kamaliyt Vilku⁴, Piotr Sweirgon⁴ and Lloyd Simons⁴**

¹Boundary Bend Ltd; ²Modern Olives; ³Boundary Bend Estate Processors Pty
Ltd; ⁴Food Science Australia

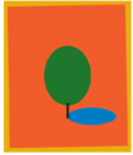




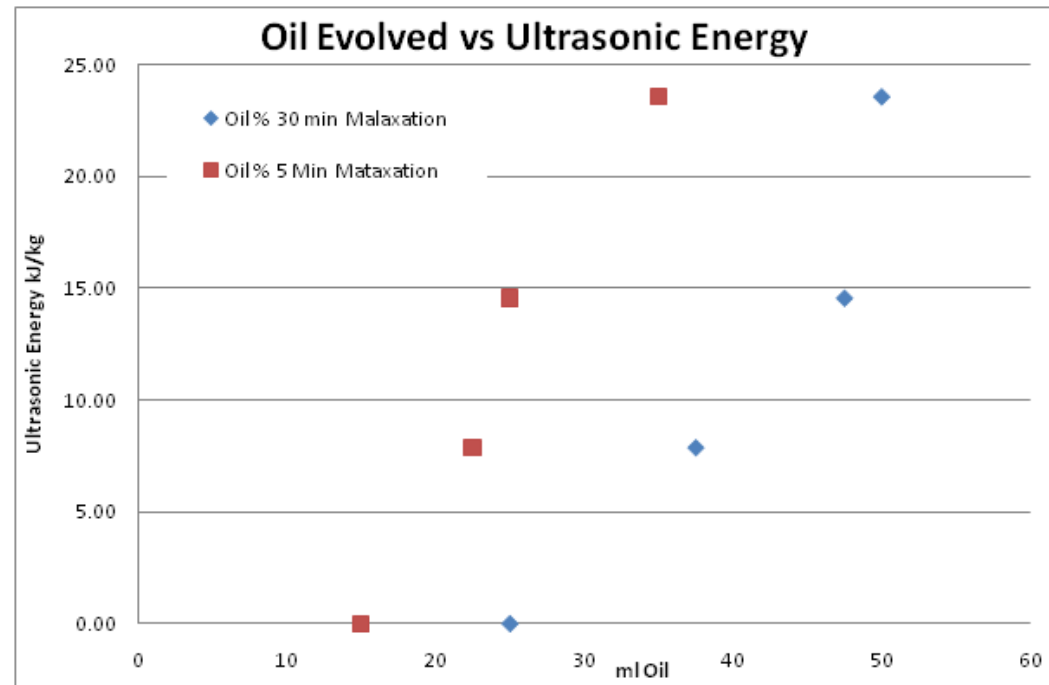
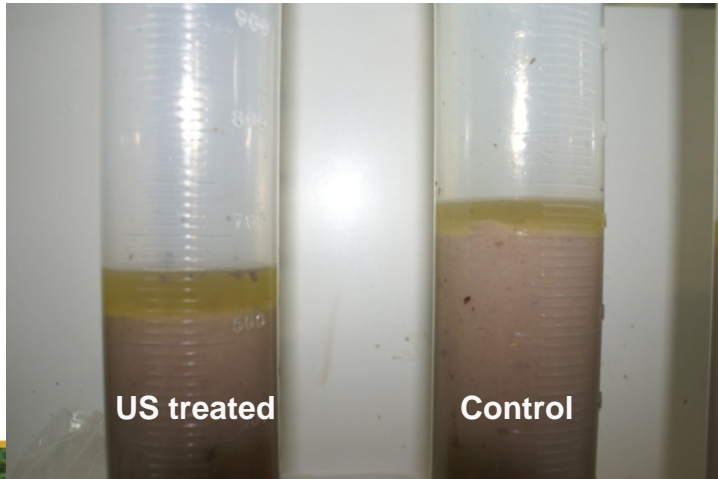
Ultrasound

- Research in very early stages
- Olive paste is supplied with ultrasound energy in order to break down wall cell and release the oil
- There is a beneficial increase in the paste temperature
- It seems to be more effective on green fruit
- Lab trials showed very good results on paste extractability
- Field trials with variable results. More work to be done here
- No apparent impact on oil quality





Ultrasound – Lab trials





Ultrasound – Field trials

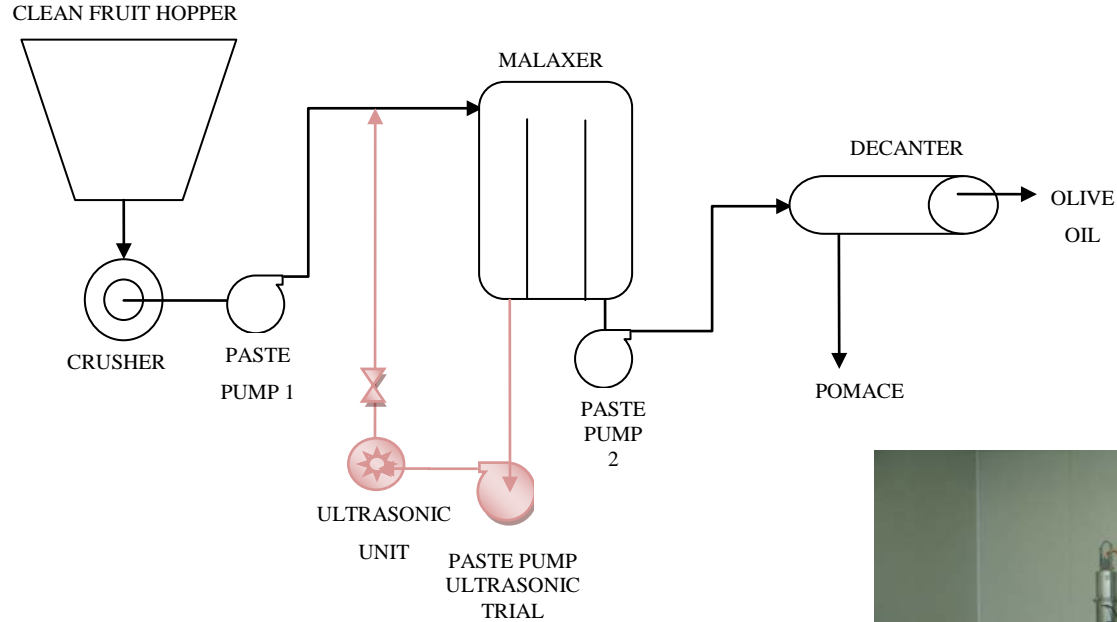
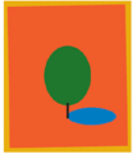
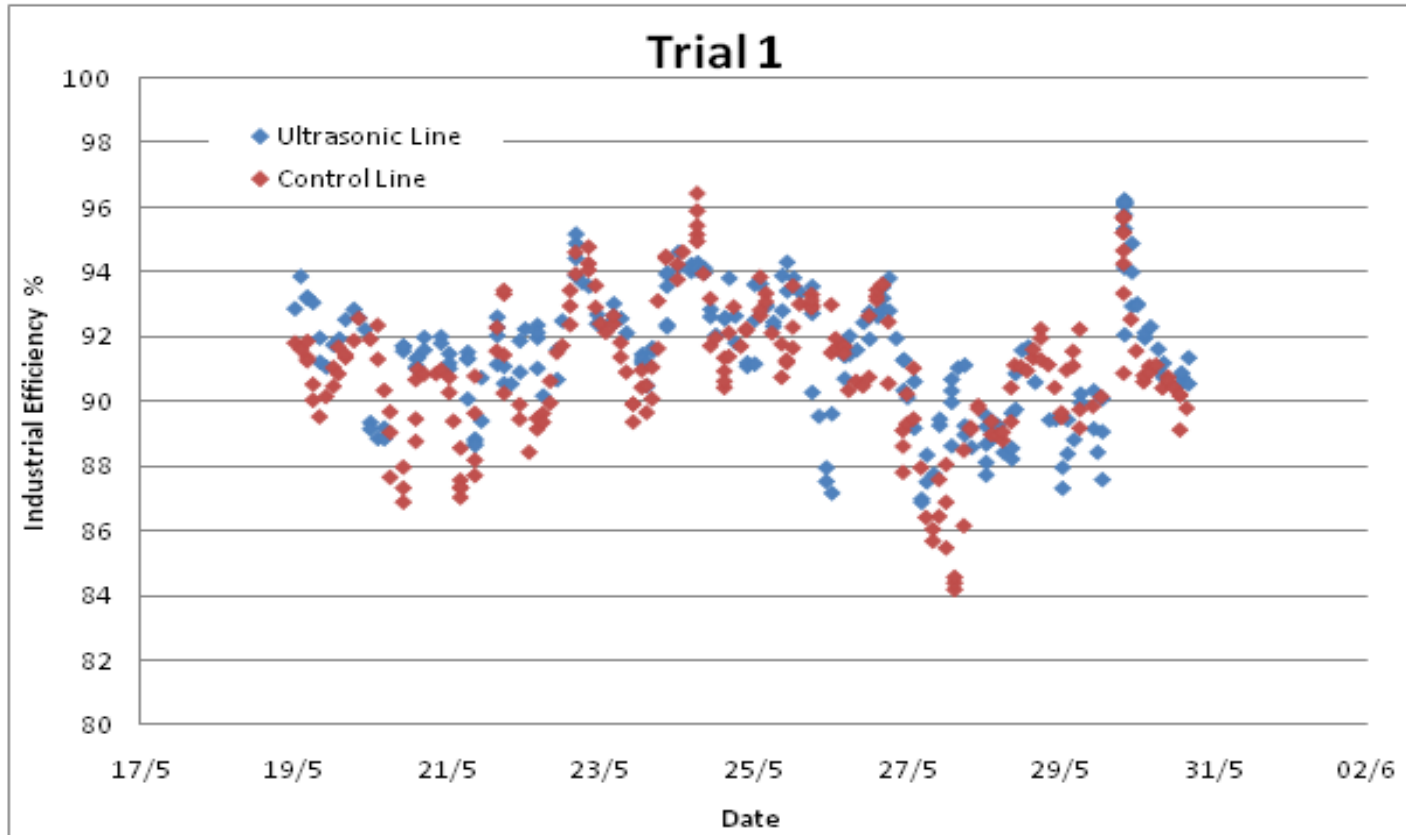


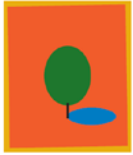
Figure 1: Process Flow Diagram





Ultrasound – Field trials

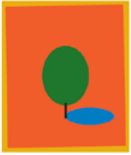




Summary

- Talc & microtalc powder: essential with difficult pastes or high moisture fruit. No impact on oil quality
- Common salt: a cheap option. No impact on oil quality. There could be environmental issues
- Calcium carbonate: another cheap option. High paste extractability. There could be issues with oil quality
- Enzymes: Effective under most conditions. Doses depend on the year and fruit ripeness. No impact on oil quality
- Warm dipping: an option for small plants. Only effective with temperatures above 60°C. It does change the oil
- Ultrasound: Promising technology. No impact on oil quality
- Microtalc powder & enzymes could be an interesting combination





Thank you!

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