



Introduction to CDI Technology

March 2023

Outline

From: Kirk Moir

Sent: Wednesday, March 29, 2023 1:57 PM

To: 'Shaun Richmond' <shaun@crushdynamics.com>

Cc: Alexandra Broddy

Subject: RE: Our Technology Value - Pomace VS Crush Puree

Hi Shaun,

As discussed just now, let's put together a document with:

- 1) My "wine industry knowledge" slide
- 2) UCD slide(s) on astringency and time delay (?)
- 3) Possibly Penn State on astringency in food / chocolate
- 4) UBC slide on de-gcyoclation
- 5) SFDC slide on antiox numbers
- 6) Polyphenol analysis from TMIC (/ UBC numbers??) for GRAS

Cheers

Kirk



More from Shaun

From: Shaun Richmond <shaun@crushdynamics.com>
Sent: Tuesday, March 28, 2023 8:13 PM
To: Kirk Moir <kirk@crushdynamics.com>
Cc: Kirsten Schwarz <kirsten@crushdynamics.com>
Subject: Our Technology Value - Pomace VS Crush Puree

Hi Kirk,

Thinking through our discussion earlier today as to simple and inexpensive R&D that demonstrates the value of our technology and impact it has on our finished product and can be understood by the average investor and/or procurement person. This is in line with the need for us to have a 3rd party-backed defense against anyone questioning impact of our technology or thinking Alvinesa or any other company with products derived from grape pomace is "already doing this".

Significant impact on polyphenol composition

Recent polyphenol composition evaluation completed on puree through the university for GRAS project should be completed on wine pomace. Graph showing numbers side by side with mention of additional points including bioavailability, size of polyphenol etc. If we demonstrate 2x and 3x original numbers of meaningful polyphenols in our puree and far higher of course in powder this will be compelling.

Quantitative Descriptive Analysis on "Bitter"

If Katy can run a sensory using QDA with a larger panel (similar to the 20 person panel discussed at Quails Gate earlier today) we can compare the raw pomace and our final puree product and demonstrate that our products are significantly less bitter than starting material. This would not speak to the more important functionality of our product in foods but would give us a good baseline to say this is significantly different than other grape-based ingredients and allow us to segue into impact in application.

Let's discuss tomorrow.

Shaun





Anjinomoto analogy

- Dr. Ikeda did not discover *Umami*
Mrs. Ikeda knew all about it
- Had been known for centuries in Asia
- He discover the molecule causing it: L-glut acid
- He invented the process for isolating it (MSG)

Which he patented

His company (Anjinomoto)
now worth **\$10B**





Are we the flavour sensation of the 21st Century?



- We didn't discover **Fruity-tangy** flavour
- It's a core flavour *craving* in primates (along with salty, sweet, and fatty)
- High-phenol fruit and leaves were the largest part of primate diet for 5 million years
- We did discover what molecular mix causes this genetically-encoded craving
 - We invented a process to maximize it
 - And patented the process

Why We Exist: Doing Better with Our Food Chain



> 30M

Tonnes,
Wine Production
(Annual Global)



> 15M

Tonnes,
Derivative Produced
from Wine Production
(Annual Global)



> 50M

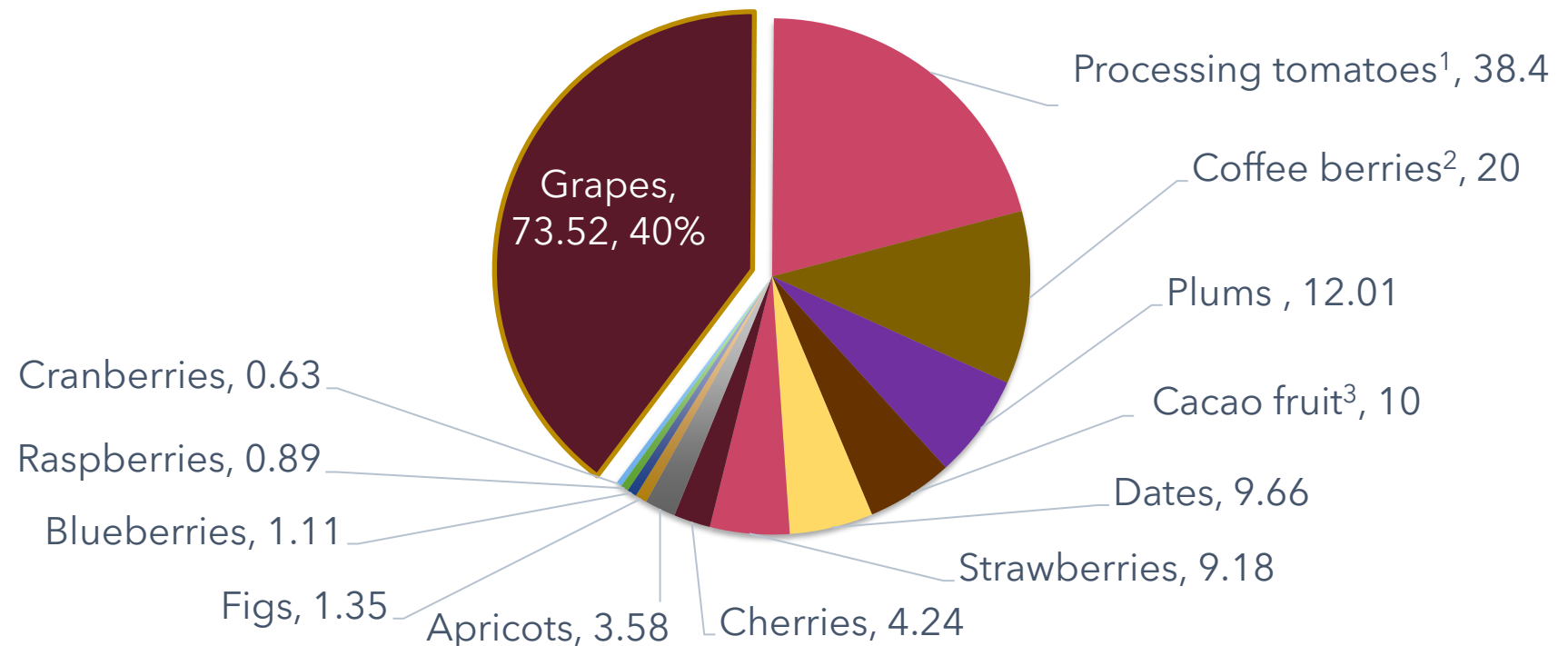
Tonnes,
CO₂ Equivalent Emissions
from
Derivative Decomposition
(Annual Global)





Grapes: *the world's largest berry crop*

World berry production 185 MMT - 2021 UNFAO



1 Tomato News 2 USDA (3x coffee bean volume) 3 World Cocoa Foundation (4x Cacao bean production)

WCI fermentation process can be used for any of the sidestreams



CDI's Patented Bio Mechanical Process



1. Harvest

Grapes are grown by our long-term winery partners to create our proprietary blend.



2. Crush

Grapes are crushed and transferred to Crush Dynamics processing facility within 24 hours.



3. Clean

Grapes are received, cleaned and transferred into our patented bio-reactor.

Koshered / Dried / Mealed



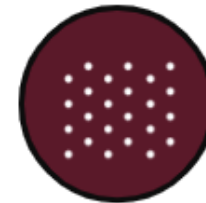
4. Ferment

A proprietary fermentation process is used to make the unique composition of polyphenols bio-available.



5. Process

The fermented material is finished using heat and shearing to complete bio-transformation of polyphenols.



6. Dry

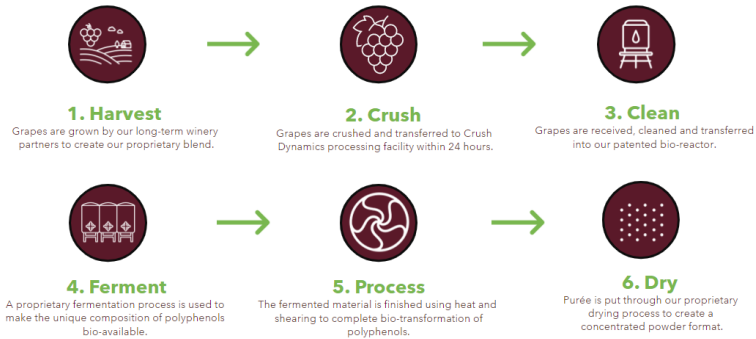
Purée is put through our proprietary drying process to create a concentrated powder format.

Rehydrated

Optional

Intellectual Property: Pathway to Protected Market

“Taming the Tannins”



Proprietary Fermentation Patents & Patents Pending

1. Bio-Transformed Polyphenols Product by Process (GRANTED)
2. Low Cost BioReactor Equipment
3. Bio-Transformed Polyphenols for Texturization

Trade Secrets

- Microbial Starters for expanding product line based on current and future agricultural side streams

IP Strategy Doc Available (under NDA)



Today's Product Line: Flavour Enhancement Ingredients



Crush Dynamics

Gold Purée and Ruby Purée *for maximum flavour, texture, and value*
Gold Powder and Ruby Powder *for convenience*



Summary :: Key Functional Compounds

Total Phenolics and Antioxidant activity

Highly Concentrated in Ruby Powder and Gold Powder

Compared with industry standard natural preservatives
Rosemary, Olive Oil and Thyme extracts



Table 1
Antioxidant Performance of CDI products

Substances	Antioxidant activity (mgTE/100g)	Antioxidant scores (Rosemary extract units)
Ruby Powder	1706	345.5
Gold Powder	2591	227.5
Olive oil extracts	6.75	0.9
Rosemary lyophilized extracts	7.5	1.0

Table 2
Phenolics Content

Substances	Total phenolics (mg GA/100g)	Phenolics scores (Rosemary extract units)
Ruby Powder	912	6.4
Gold Powder	853	6.0
Olive oil extracts	27.9	0.2
Rosemary extracts	142.4	1.0
Thyme extract	101.4	0.7

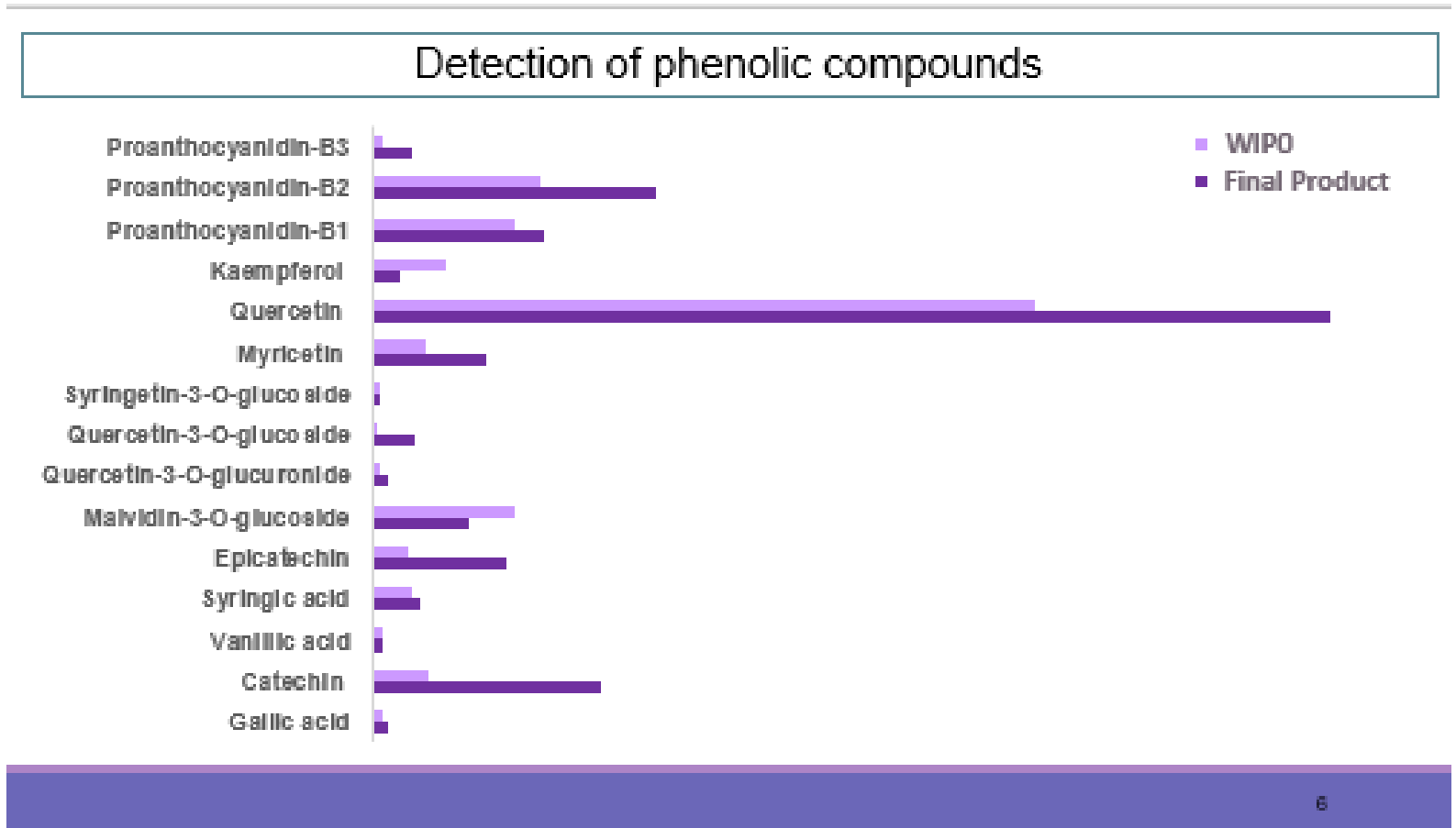
*Marina Bubonja-Songe, Jasminka Giacometti, Maja Abram (2010) Antioxidant and antiliteral activity of olive oil, cocoa and rosemary extract polyphenols.

CDI Process Impact on Polyphenol Content



Dr. Barbara Stefanska

Assistant Professor -
Nutritional
Epigenomics



Advancing Food Science with **Wine Industry Knowledge**

Tannins are known to be both Astringent and Bitter

**Grape
Tannins**

**Wine Industry
Knowledge**

**Crush Dynamics
Intellectual Property**

Astringence

Key to Taste & Flavor Acuity
Impact of Wine

Enhanced via Patented
Bio Mechanical Process

Bitterness

Address through
Aging, Breathing, and/or
Aeration

Proprietary Process
to
"Tame the Tannins"

Transforming Tannin Rich Agricultural Sidestreams into High Performance Food Flavor Ingredients



UC Davis (A. Oberholster) on **Astringency**



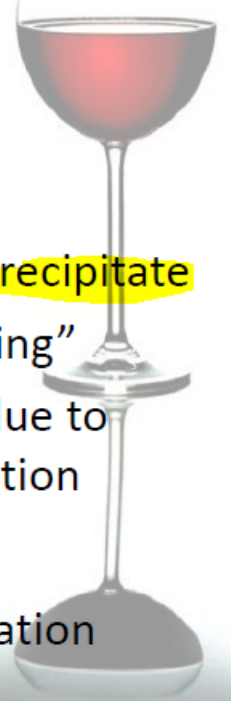
**Dr. Anita
Oberholster**

PhD
Wine
Chemistry



Astringency Perception

- Astringency described as “roughing”, “drying” and “puckering”
- Tactile sensation
- Mechanism of astringency
 - Phenols bind with saliva proteins and precipitate
 - Stripping the mouth of lubrication “drying”
 - Texture effect of astringency could be due to precipitated complexes or those in solution
- Astringency is **dynamic process**
 - Changes during ingestion and expectoration



Oberholster (2008)

Penn State (Ziegler & Hopfer) on **Astringency in Food**



Dr. Greg Ziegler



Dr. Helene Hopfer

Received: 18 February 2019 | Revised: 10 June 2019 | Accepted: 5 September 2019

DOI: 10.1111/joss.12541

ORIGINAL ARTICLE

Journal of **Sensory Studies**  **WILEY**

Flavor and mouthfeel of pseudo-cocoa liquor: Effects of polyphenols, fat content, and training method

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Abstract

Current theories of astringency propose that this sensation is a result of delubrication in the oral cavity due to precipitation of salivary proteins. Astringency, commonly described as a drying or puckering sensation, is a main driving factor for rejection of certain foods. Previous studies have shown that fat plays a role in moderating astringency in foods. **To investigate the role that polyphenols and fat play in astringency**





In Summary

Crush Dynamics upcycles tannin rich Wine Production Derivatives into high performance food flavour ingredients, powered by:

Fermented
Polyphenols



1st Side Steam:
Wine Production Derivatives





**Crush
Dynamics™**

Better for People.
Better for the Planet.