

Evolva's 21st Century Brewing

Synthetic Biology

The Emergence of a New Value-Chain?

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Industrial BIO - Montréal

24th July 2017



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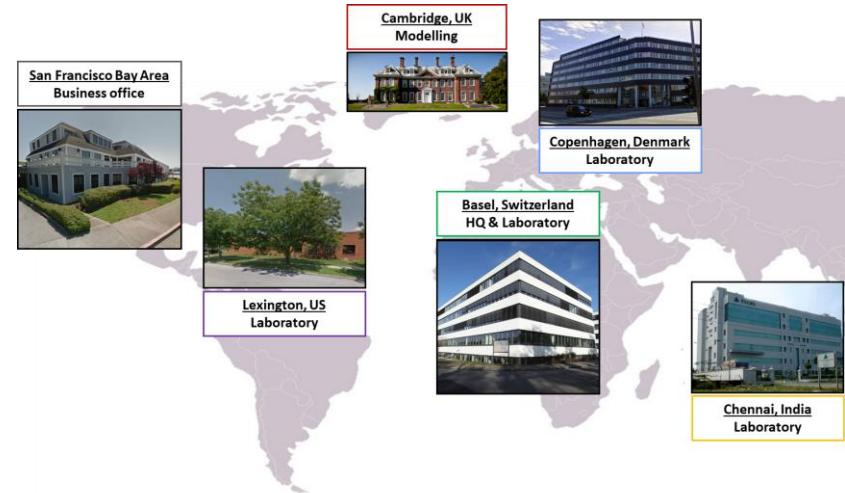
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Evolva – The More or Less Conventional Description

- **Multi-site company with >180 people across 3 continents**
 - Ca. 125 in R&D, Scale-up & production
- **4 Products on Market**
 - US-EU-JP
- **A 21st century brewer of specialty ingredients**
 - >\$200mn in technology, >500 patents
- **B2B business model**
 - Create & manufacture high value and innovative products for other companies
- **Solving the supply chain issues of nature**
 - Most natural ingredients limited by how they made
- **Track record of taking products from “blank sheet of paper to market” several times**





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What we stand for: ingredients that matter

Stevia



- Great taste – far better than current stevia
- Can go to zero calories - less sugar in your diet
- *Cargill partnership - sales potential in excess of \$200mn*

Nootkatone

On Market US-EU-JP



- Kills & repels ticks, mosquitoes and other insects
- Safe enough to eat – approved food ingredient
- *Own product - sales potential in excess of \$100mn*

Resveratrol

On Market US-EU



- The “good ingredient” in red wine. 9,000 publications
- Applications from consumer health to aerospace
- *Own product - sales potential in excess of \$100mn*

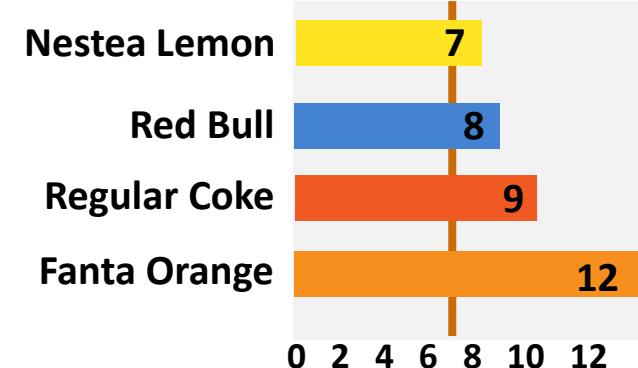


Stevia

Major need to reduce sugar consumption

- WHO recommends 6 teaspoons/day
- ≈ 200 bn cans in USA p.a. ≈ c. 1.7 cans/person/day

Sugar in ONE 12oz
soft drink



Stevia a plant-derived, zero-calorie sweetener

- But current versions (Reb A) taste horrible at high levels
- Cannot reach zero calories



The plant also contains "great tasting" ingredients

- Reb D, Reb M - you can reach zero calories
- But very low levels in plant = too expensive

Coca-Cola Life
65/35 sugar/stevia



- **EverSweet™ = great tasting Reb D/M blend**
 - Taste repeatedly validated
 - Strong IP – 6 granted and 69 pending patents
 - "No Objection" letter received from FDA May 2016
- **Launches 2018**
 - Exclusive Partnership with Cargill
- **Estimate addressable market at c. \$4 billion**
 - ≈ 50% of HFCS + 10% of sugar used in beverages today
 - Total market for sugar/HFCS etc. c. \$70 billion

AMAZING TASTE & APPLICATIONS

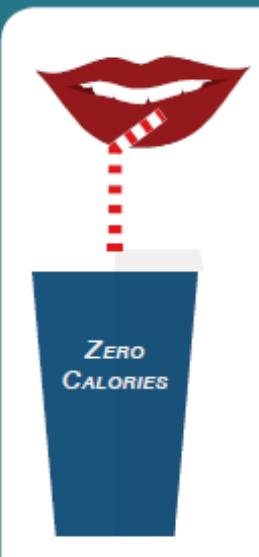
Cargill's EverSweet™ sweetener is made with the same sweetness that is found in the stevia leaf, to delight your taste buds with calorie-free joy.



REB D and M

Make up less than 1% PERCENT of the actual stevia leaf

At a time when more consumers are watching their calorie intake and striving to live a healthier lifestyle, EverSweet™ sweetener offers a new, delicious choice for reduced and zero calorie food and beverages.

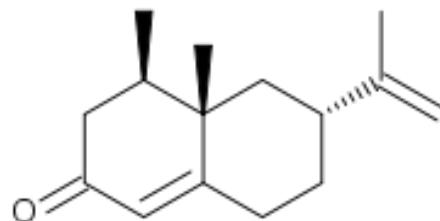




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Applications

Nootkatone



14 granted
19 pending
patents

Consumer & Household Protection



Food Chain



Food Processing



Animal Health



Plant Protection

Flavour & Fragrance

noot.evolva.com

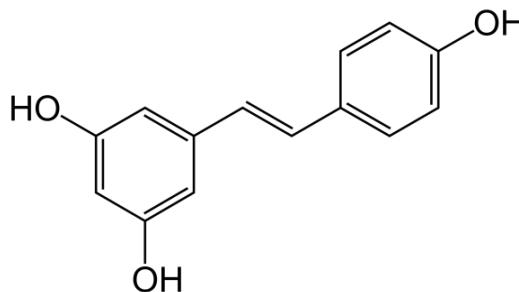




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Applications

Resveratrol



39 granted
14 pending
patents

Advanced Materials

Consumer Health & Nutrition

Food Chain

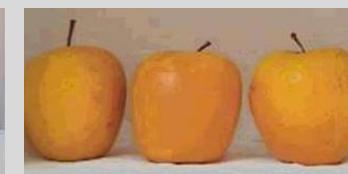
Advanced Materials



Veri-te
RESVERATROL



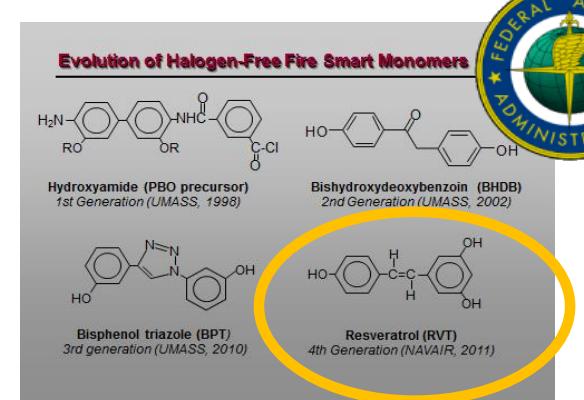
75 days
distilled water



75 days
0.004% Resv.



Animal Health



Light, strong,
fire and heat
resistant composites

Aerospace, automotive, aviation,
batteries, clothing, construction,
energy transmission, shipping.



Vast Majority of Natural Ingredients Have “Supply Chain” Issues

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Resveratrol



Skin Aging



Citrus



Stevia



Adiposity



Mogroside



Nootkatone



Frankincense



Huperzine



Blueberry



Ginger



Azulene



Rowan



Caffeine



Jasmonates



Saffron



UV blockers



Androgens



Cloves



Raspberry



Ergot



Ginseng



Heparin



Mint



Cocoa



Gibberellins



Opiates



Abscisic A.



Humulene



Betanin



Insect Phmns



Taxol



Propolis



Agarwood



Indigo



Sandalwood



Carmine



HMOs



Vanillin



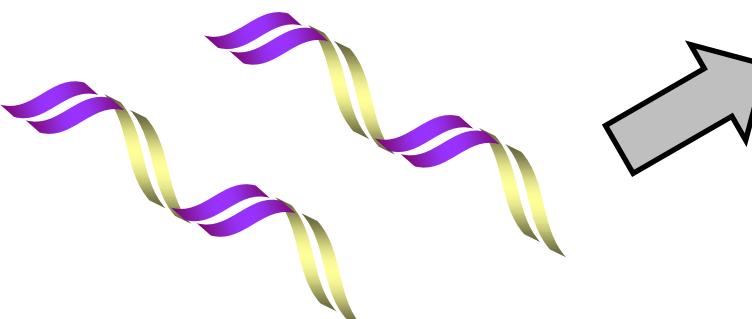
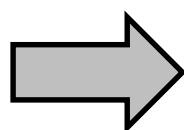
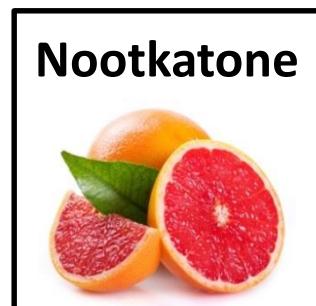
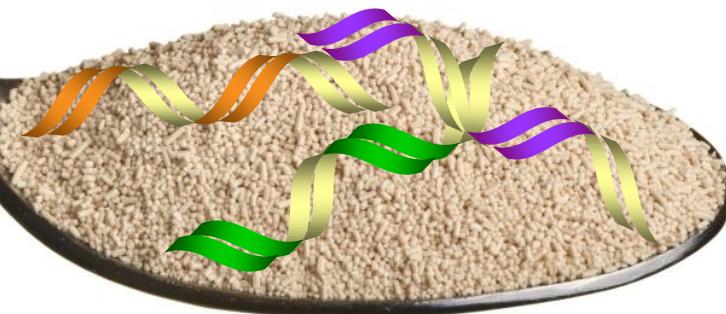
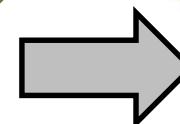
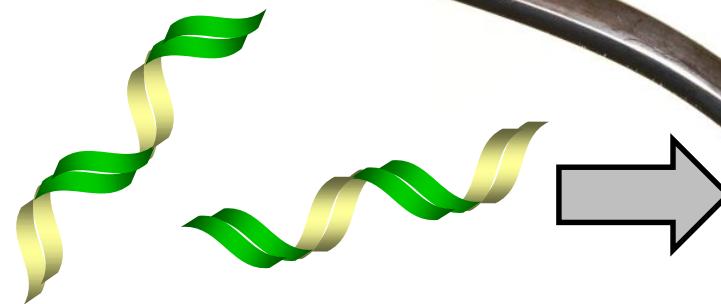
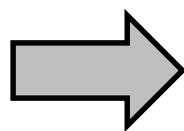
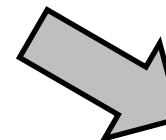
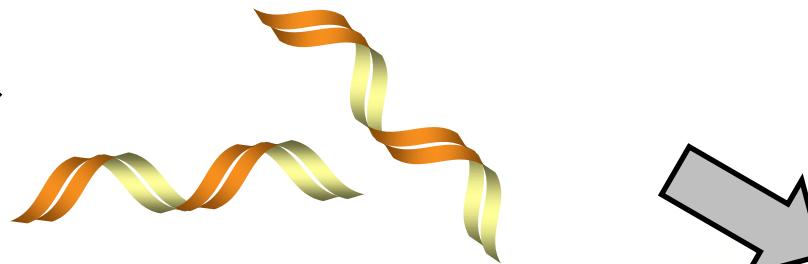
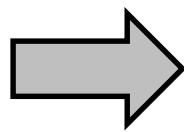
Unavailable





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But, if you move their genes into yeast ...



Yeast



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... You can make them all by brewing

Resveratrol



Skin Aging



Citrus



Stevia



Adiposity



Mogroside



Nootkatone



Frankincense



Huperzine



UV blockers



Cocoa



Saffron



Mint



Taxol



21st Century Brewing

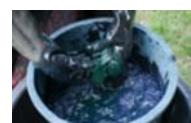
Propolis



Agarwood



Indigo



Sandalwood



Carmine



HMOs



Vanillin



Unavailable





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Using the same process

21st Century Brewing



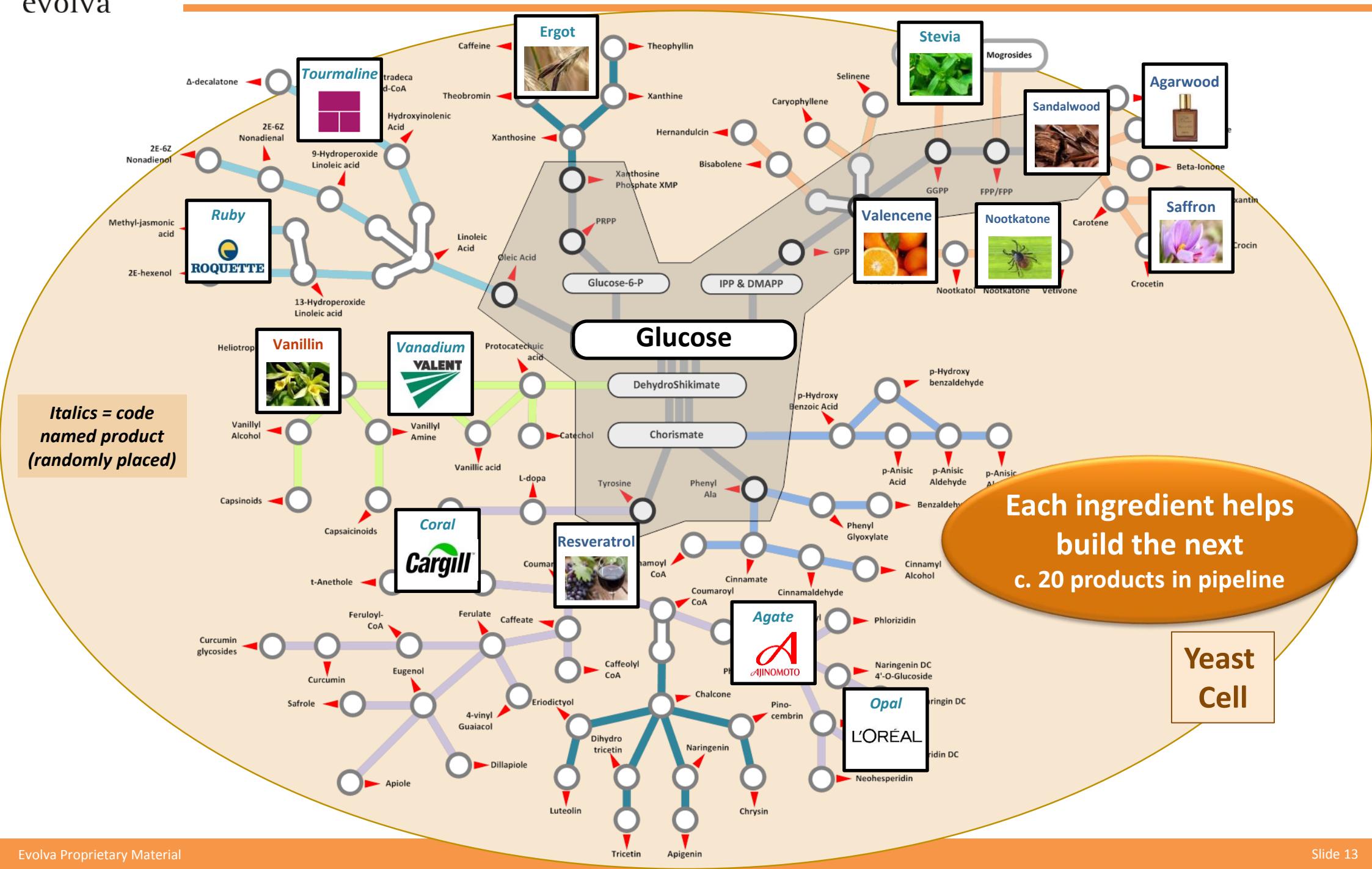
Production currently handled through contractors or partners
Will gradually internalise capability as product sales justify

Shipping



Massively scalable — everything from same network

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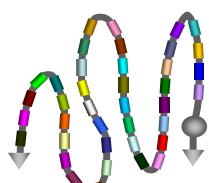
Making yeast make valuable ingredients



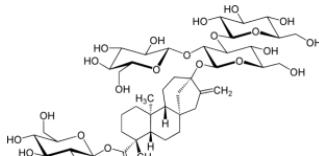
Technology

- > \$200mn invested in technology
- > 500 pending or granted patents

Advanced Genetics



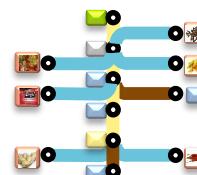
Performance Genes



Find New Ways To
Make Ingredients

Improve &
Customise Products

Production Optimisation

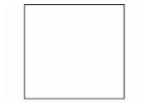


Continuously
Optimise Economics

Ingredient Function



Develop Value
Added Uses



Key benefits Evolva provides

Providing Rare Products, at more affordable prices

- **Significantly better economics**
- **Safer, shorter, more stable, more sustainable, supply chains**
- **More consistent product qualities and characteristics**
- **More customisable products and blends**
- **Better ingredients – more soluble, bioavailable, less bitter etc.**
- **New ingredients, with new benefits, become available**

Saffron



Resveratrol



Vanillin



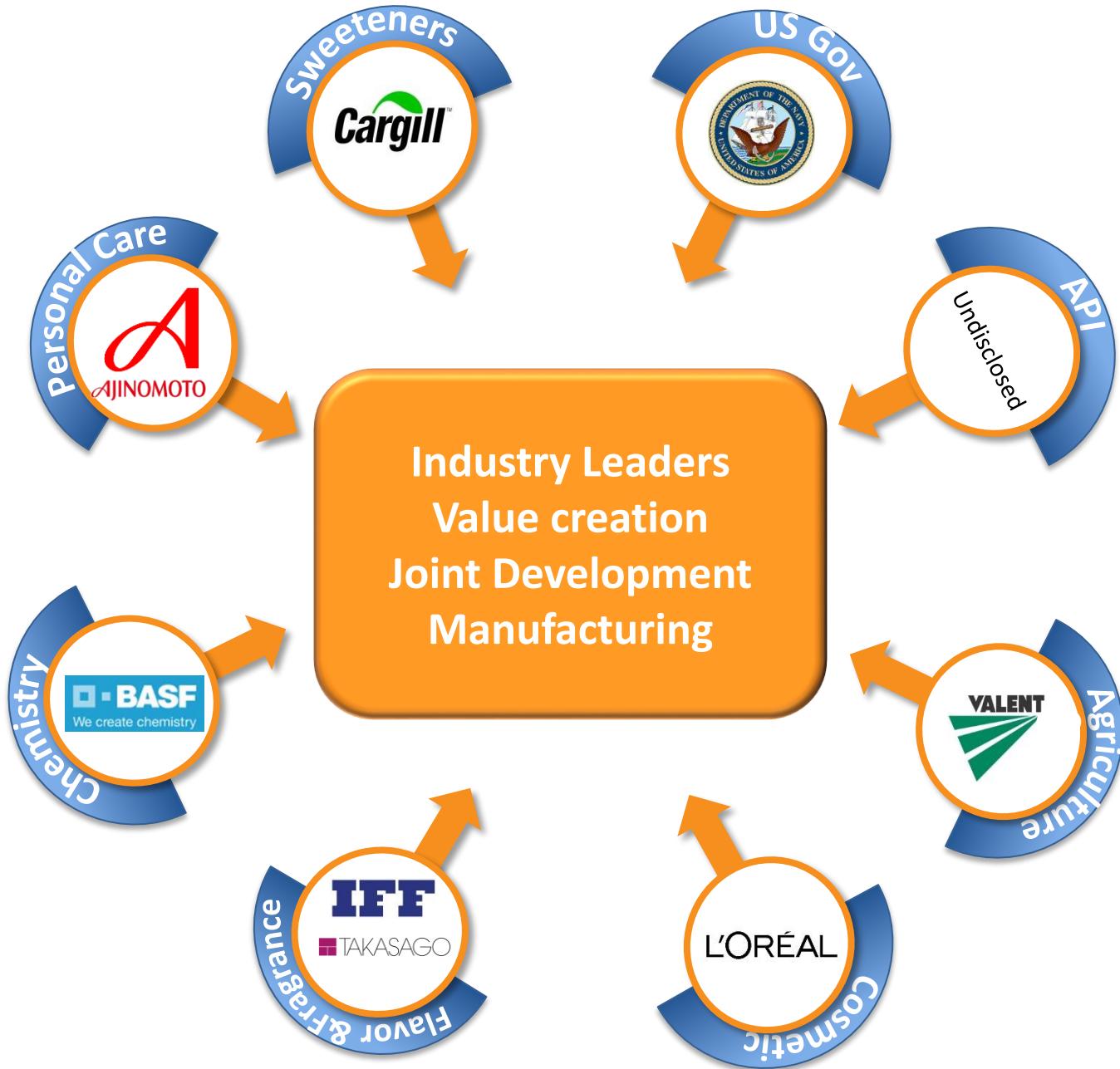
Stevia



Nootkatone



Translated in Numerous Collaborations Across Industries





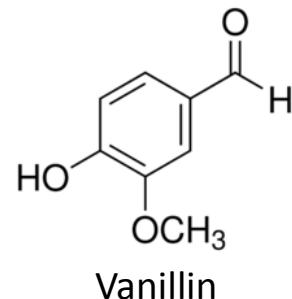
Vanillin

A Novel & Sustainable Production Route



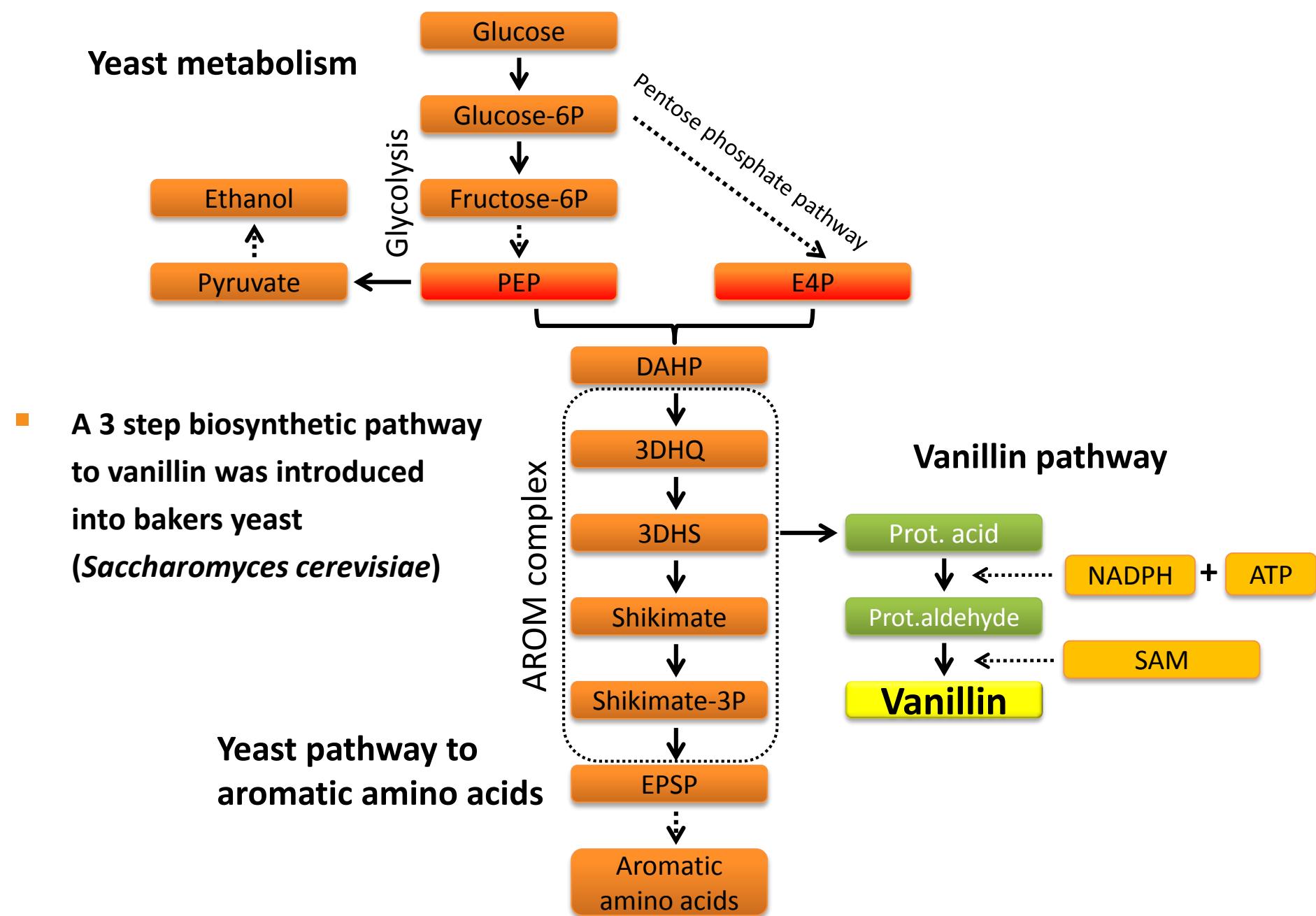
Key Points About Vanillin

- **Vanillin is the key flavour and fragrance component of Vanilla**
- **16.500 metric tonnes consumed every year**
- **Today, 98% of the market is dominated by synthetic vanillin**
 - Mainly from petrochemicals and wood pulp waste
- **Vanilla and vanillin are some of the most important flavour and fragrance ingredients worldwide**
 - Market value of >USD 650 million

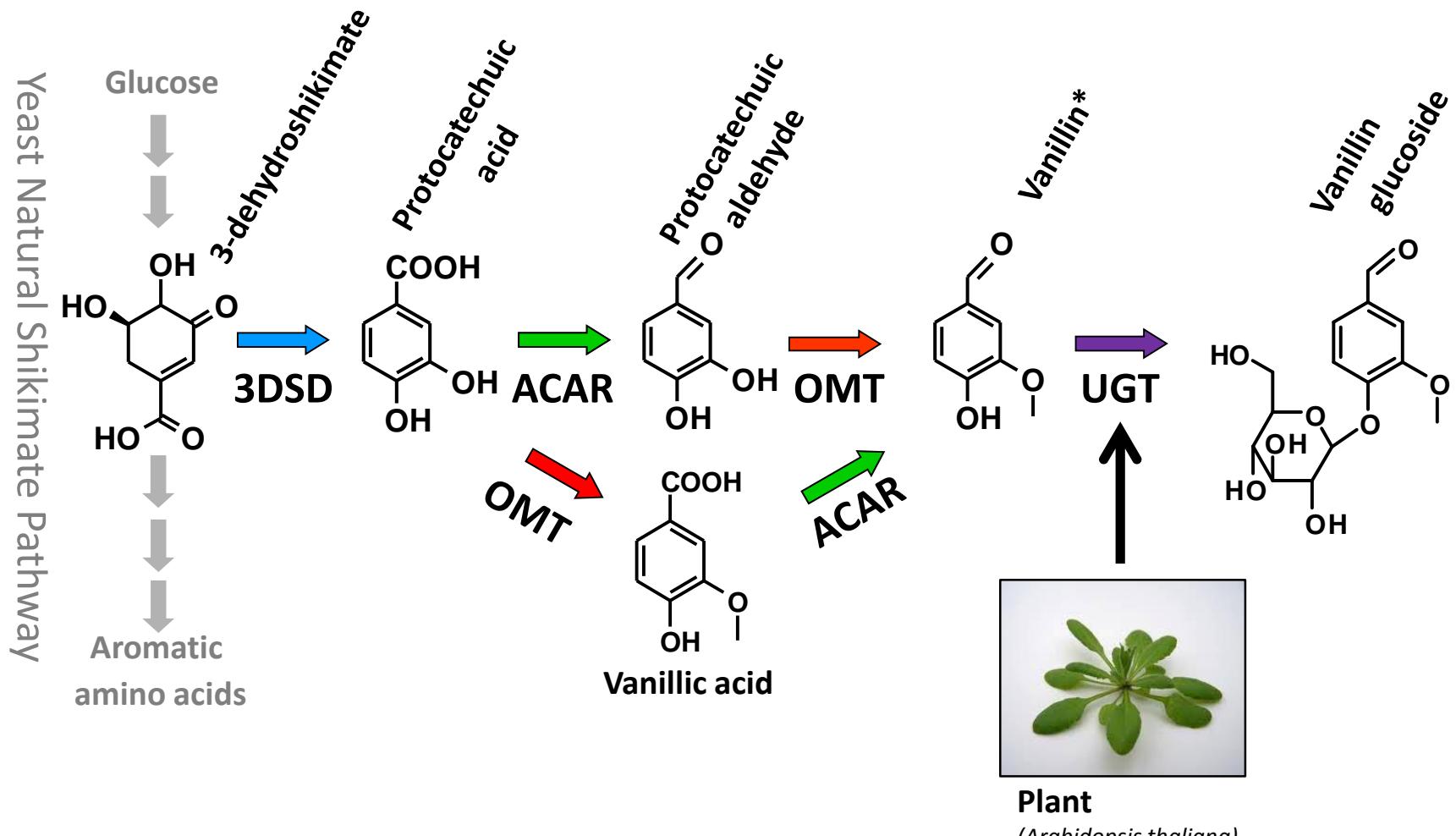




Vanillin Pathway in Yeast



Evolva's Patented Glycosylation of Vanillin Solves the Growth Inhibition Issue



Vanillin glucoside is also the natural storage form of vanillin in the vanilla orchid

* Optimized pathway to prevent formation of iso-vanillin



Value Proposition Of Evolva's Vanillin

■ For Industry

- Taste
- Naturalness
- Sustainability
- High purity & reliability
- Attractive supply chain economics



■ For Consumers

Vanillin ...

- ... not produced from petrochemicals
- ... not produced from chemically treated wood pulp
- ... with superior taste and naturalness
- ... derived from a natural feedstock and production process
- ... produced in a sustainable manner





Saffron



Farm Saffron & Evolva Saffron

■ World's most expensive spice

- Global prices up by 48% * between 2011 and (from \$ 1500 / kg) -2015 (to \$2950 / kg) #
- 300 MT global production – remains almost constant for last 15 years
- > 90% still comes from Iran; exports to 46 countries

**1 kg of saffron =
stigmas from
~ 250,000 crocus
flowers;**



■ Evolva Saffron is not one but three molecules

- Crocin (powder) is the colour,
- Saffralal (liquid) is the fragrance
- Picrocrocin (powder) is the flavour

■ Market is held back by

- Supply chain
- Variability
- Lack of convenience factors

Saffron's key components

*

Crocin	2%
Picrocrocin	2-3%
Safranal	1-2%
<u>TOTAL</u>	6-7%

Other aroma elements	1%
<u>Other color elements</u>	8%
<u>TOTAL</u>	9%

"Inert" molecules

Carbohydrates	45%
Simple sugars	12%
Fats	5%
Water	10%
Proteins	12%
Minerals	1%
<u>TOTAL</u>	85%

* Varies based on geography, years of harvest, etc

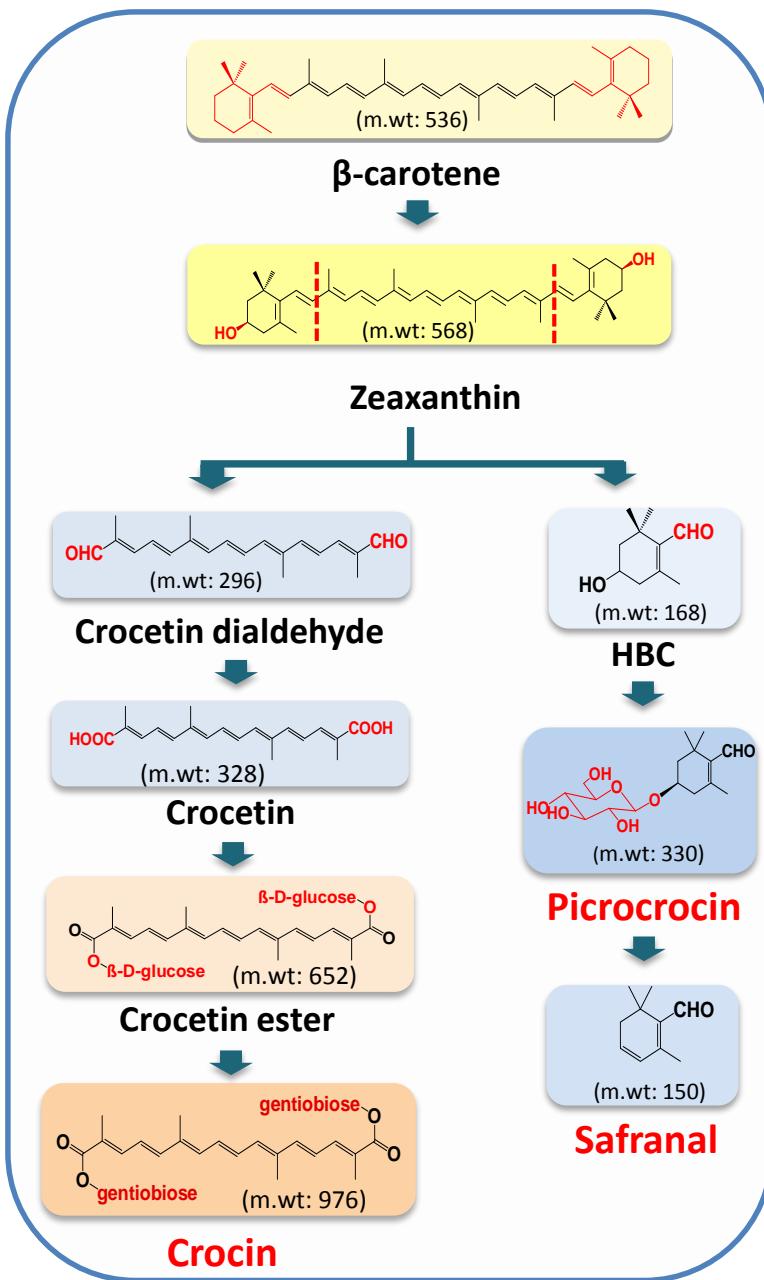
As per BBC, 26th Dec 2013 – 1 Kg Saffron = \$ 2950 & IRAN customs , October 2013 – 1 Kg = \$ 3050

* As per CNN Money, June 2015



Three Key Molecules to Cover Saffron “Attributes”

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■ Evolva Saffron

- **PICROCROCIN** (powder) is the flavour
- **CROCIN** (powder) is the colour
- **SAFRANAL** (liquid) is the fragrance

Start Fermentation Run End



Metabolically enhanced
Baker's Yeast – producing Saffron
molecules (Crocin)



The Benefits of Our Saffron

■ More Affordable

- **Price:** Very competitive versus farmed Saffron
- **Potency:** Our saffron will be more potent than plant saffron

■ Simpler, More Stable Supply Chain

- Consistent pricing, consistent quality
- No adulteration
- No geopolitical risk

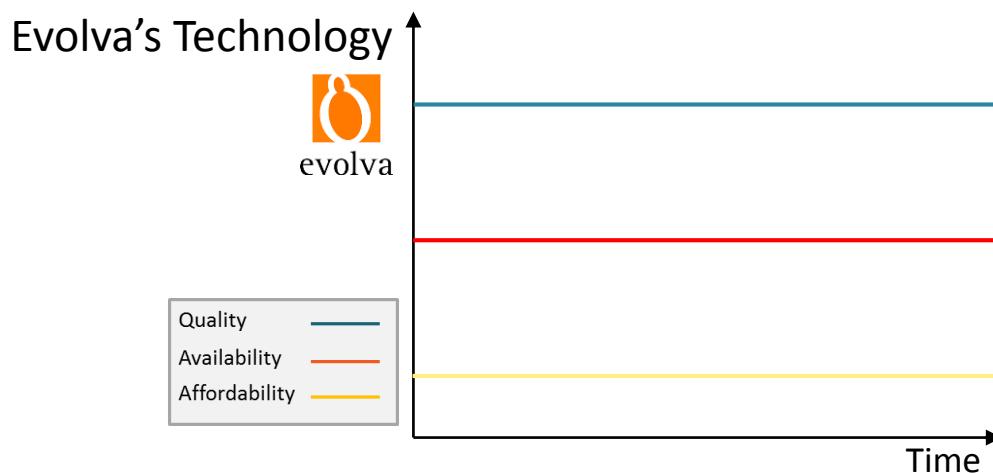
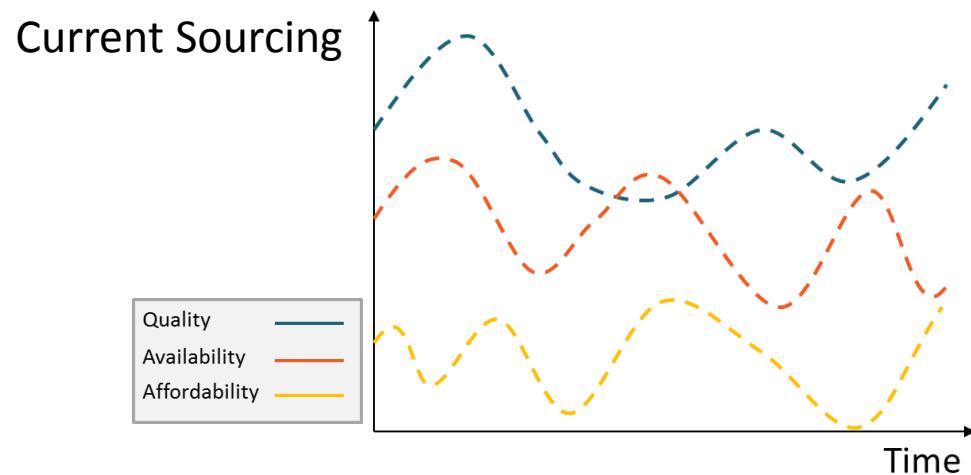
■ Easier to Use for Consumer Products

- Do not have to infuse the stigma to get the saffron released
- Easier to formulate

■ Customizable

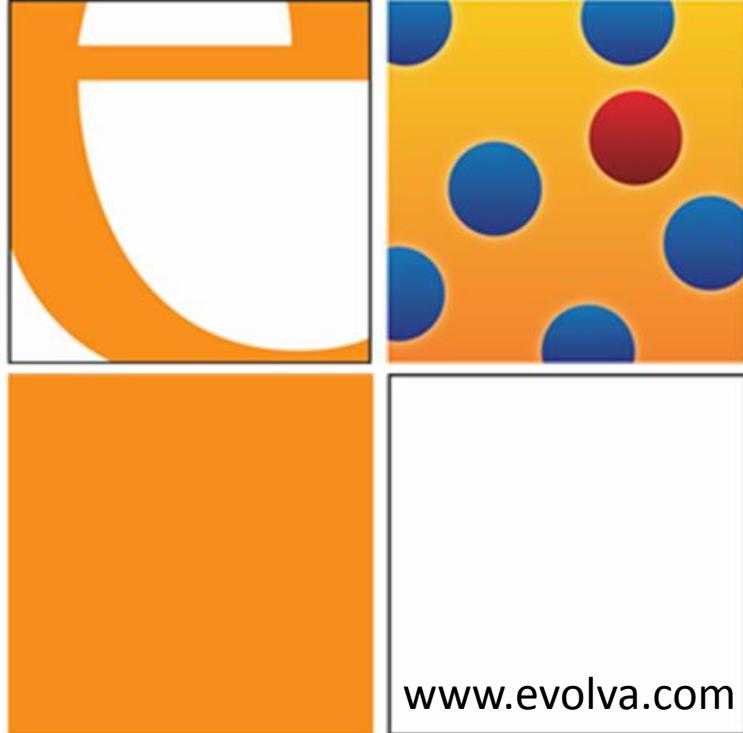
- Can adjust ratio of Safranal, Crocin, Picrocrocin

Meeting the Industry Needs: Solving the Supply Chain Issues of Nature



Evolva's 21st Century Brewing

- Quality
- Availability
- Affordability



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