Yield10 BIOSCIENCE

Yield10 Bioscience, Inc.

Breakthroughs in plant based PHB production

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ISBP 2022

Sept 16, 2022

Sustainable Growth Starts with a Seed

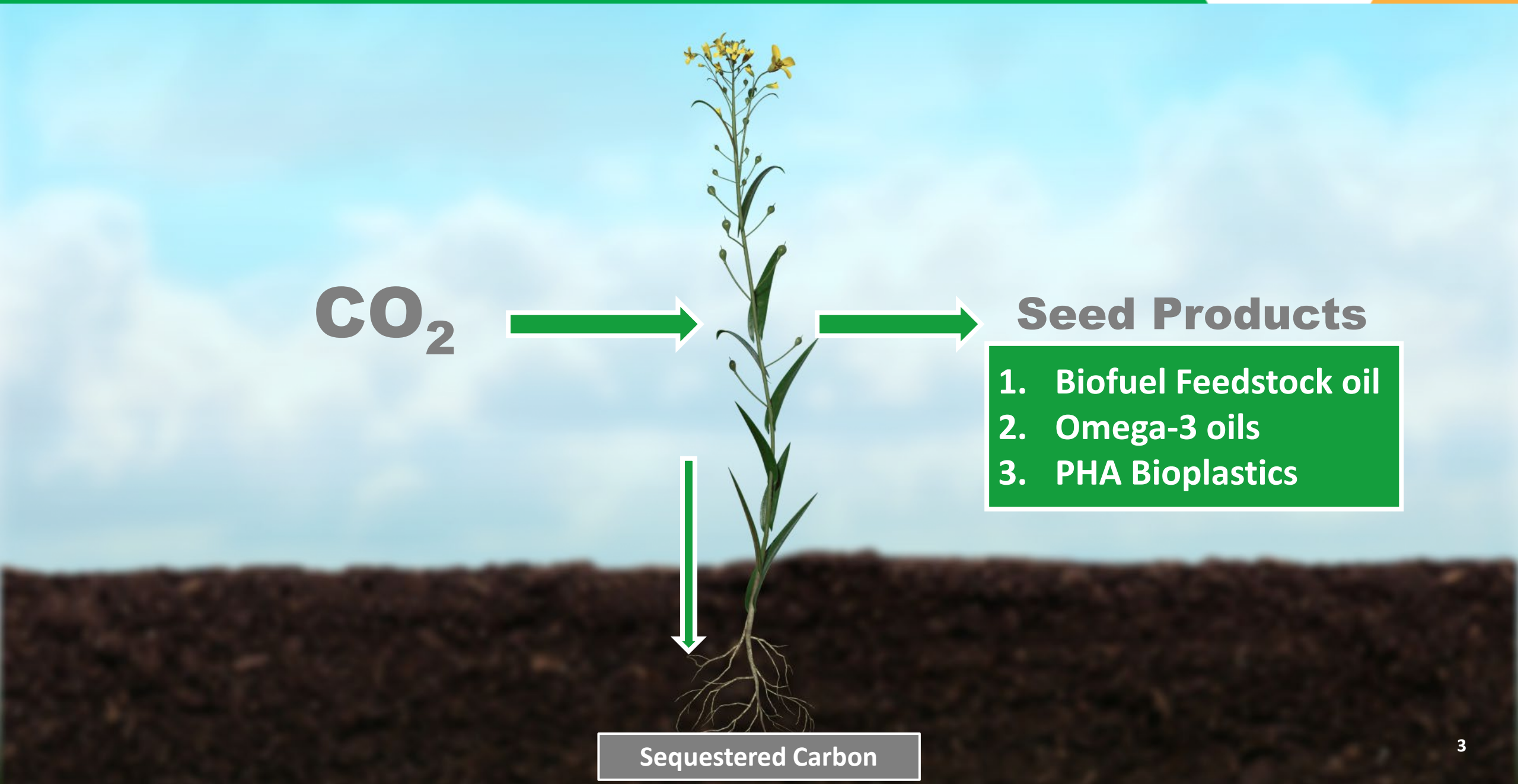
Safe Harbor Statement*

The statements made by Yield10 Bioscience, Inc. (the "Company," "we," "our" or "us") herein regarding the Company and its business may be forward-looking in nature and are made pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. Forward-looking statements describe the Company's future plans, projections, strategies and expectations, including statements regarding future results of operations and financial position, business strategy, prospective products and technologies, expectations related to research and development activities, timing for receiving and reporting results of field tests and likelihood of success, and objectives of the Company for the future, and are based on certain assumptions and involve a number of risks and uncertainties, many of which are beyond the control of the Company, including, but not limited to, the risks detailed in the Company's Annual Report on Form 10-K for the year ended December 31, 2021 and other reports filed by the Company with the Securities and Exchange Commission (the "SEC"). Forward-looking statements include all statements which are not historical facts and can generally be identified by terms such as anticipates, believes, could, estimates, intends, may, plans, projects, should, will, would, or the negative of those terms and similar expressions.

Because forward-looking statements are inherently subject to risks and uncertainties, some of which cannot be predicted or quantified and may be beyond the Company's control, you should not rely on these statements as predictions of future events. Actual results could differ materially from those projected due to our history of losses, lack of market acceptance of our products and technologies, the complexity of technology development and relevant regulatory processes, market competition, changes in the local and national economies, and various other factors. All forward-looking statements contained herein speak only as of the date hereof, and the Company undertakes no obligation to update any forward-looking statements, whether to reflect new information, events or circumstances after the date hereof or otherwise, except as may be required by law.

*Under the Private Securities Litigation Reform Act of 1995

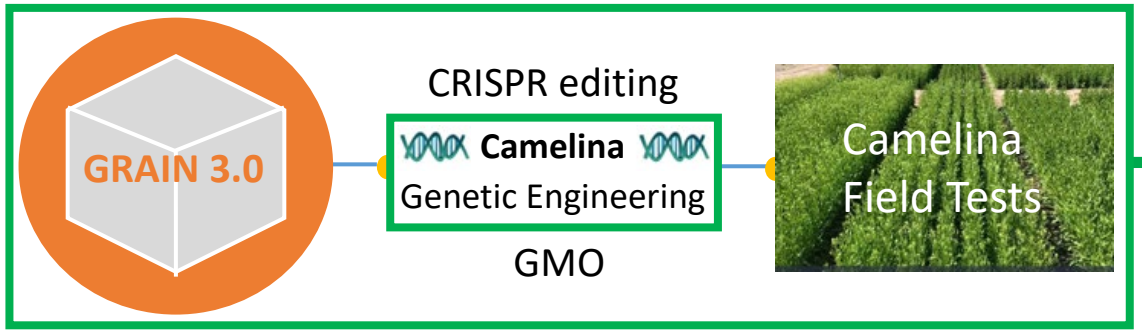
Yield10's Camelina Platform Oilseed Crop



Yield10's Trait Factory and Business Models

From Crop Science to Low Carbon Intensity (CI) Biofuels Feedstock Oil

Technology Platform - "Trait Factory"[1]



Camelina Renewable Seed Products

1. **Feedstock Oil (Biofuel)**
2. **Omega-3 Oil (EPA+DHA)**
3. **PHA Bioplastics**

Yield10: Biofuels Commercial Development Plan

- **Now**: Launching proprietary Camelina with improved germplasm as low CI biofuels feedstock crop
- **Next**: Address growers needs with herbicide tolerance (*over-the-top weed control, tolerance to herbicide soil residues)* and disease resistance
- **Medium to long-term**: High-value Omega-3 (EPA+DHA) and PHA Bioplastic traits to significantly increase revenue per acre

[1] 21 Patent Families Pending

Why Camelina?

- Promising oilseed crop
  - seed oil levels ~ 40% of seed weight
  - does not outcross with canola
- Excellent platform crop for novel high value seed products
- Both spring and winter varieties
  - winter varieties, potential use as cover crop for corn and soybean acres
- Camelina producing specialty products: ⬆ value proposition for farmer

Greenhouse grown Camelina

Camelina field plots at flowering

Large scale winter Camelina growth

Yield10 Camelina Review: *Camelina sativa*, an oilseed at the nexus between model system and commercial crop. Malik et al., Plant Cell Rep., 2018

PHA in Camelina: A Third Oilseed Coproduct

PHA Oilseed Coproduct

Camelina Field

Camelina Seed Pods

Camelina Seed

PHA producing Camelina: 3rd coproduct

Polymer

Seed Meal

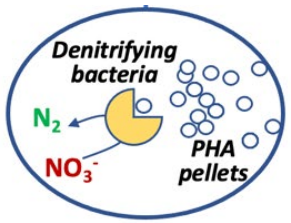
Seed Oil

Conventional Camelina: 2 coproducts

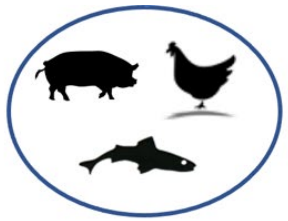
PHA – Potential Markets

Plastics

Chemicals
(via thermolysis)



Water Treatment



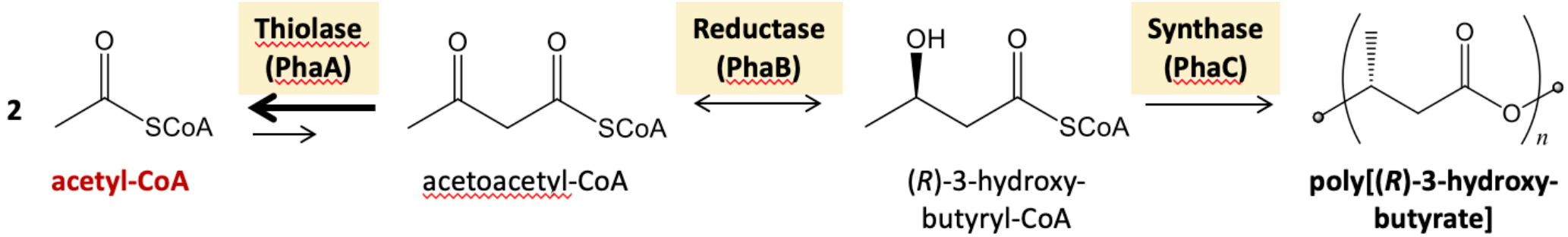
Feed

Yield10 references - PHB to chemicals

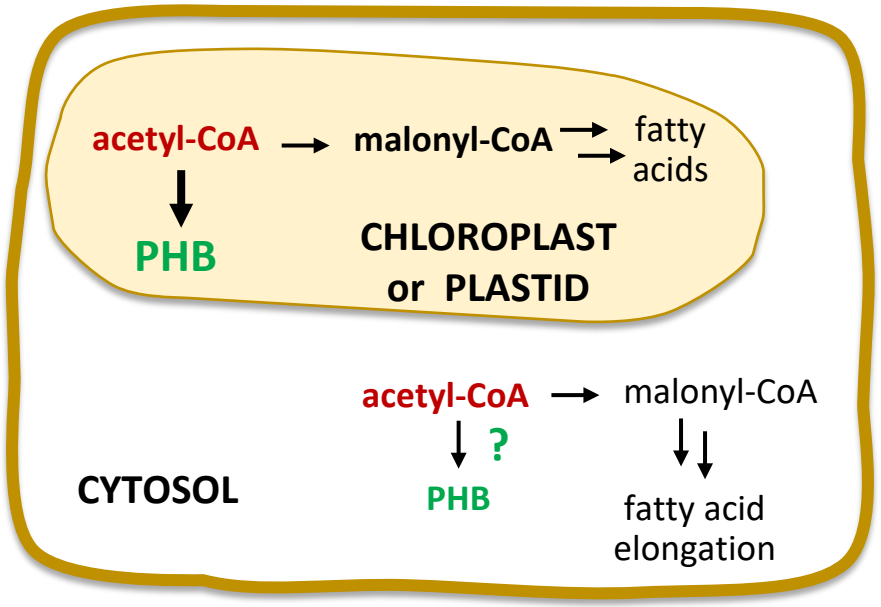
- Acrylates via metathesis of crotonates, Schweitzer & Snell, **2015**, *Org Process Res Dev*, 19, 715.
- *n*-butanol, Schweitzer et al., **2015**, *Org Process Res Dev*, 19, 710.
- Pyrolysis of P3HB/switchgrass Blends to produce crotonic acid, Mullen et al. **2014,** *J Anal Appl Pyrolysis,* 107, 40.

PHB Pathway Well Suited to Oilseeds

Native bacterial PHB biosynthetic pathway



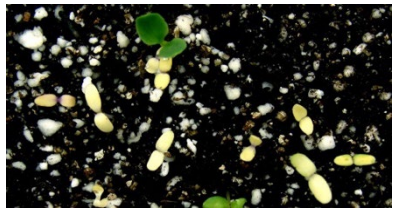
Engineered plant cell



- Production in chloroplasts/seed plastids has yielded high levels of PHB in plants, but often with impaired growth[1]

Camelina wildtype seedlings

Camelina seed specific plastid PHB producers



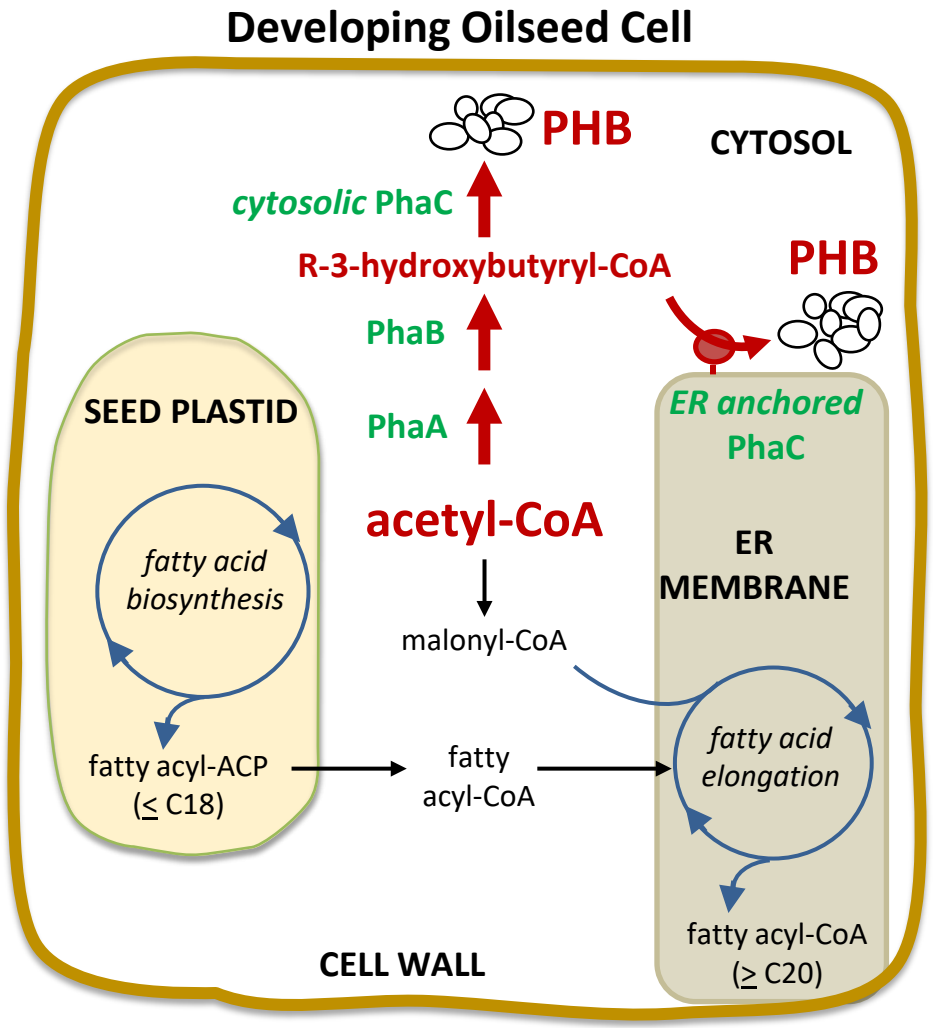
- Little reported success with cytosolic production (*highest reported level 0.34% dry cell weight*)[2]

[1]**Yield10 reference for production of PHB in Camelina seed plastids, Malik et al.,** 2015, *Plant Biotechnol. J.* 13, 675.
[2]**Production in cytosol of cotton fibers, John & Keller,** 1996, *P. Natl. Acad. Sci. USA.* 93, 12768.

Revisit Production of PHB in Cytosol of Seed

Capture portion of acetyl-CoA in cytosol of seed for production of PHB

- **Two genetic constructs**
  - Construct 1: All enzymes targeted to cytosol
  - Construct 2: PhaA, PhaB targeted to cytosol; PhaC targeted to cytosolic face of endoplasmic reticulum (ER)
- **Seed-specific expression constructs transformed into Camelina, lines isolated**



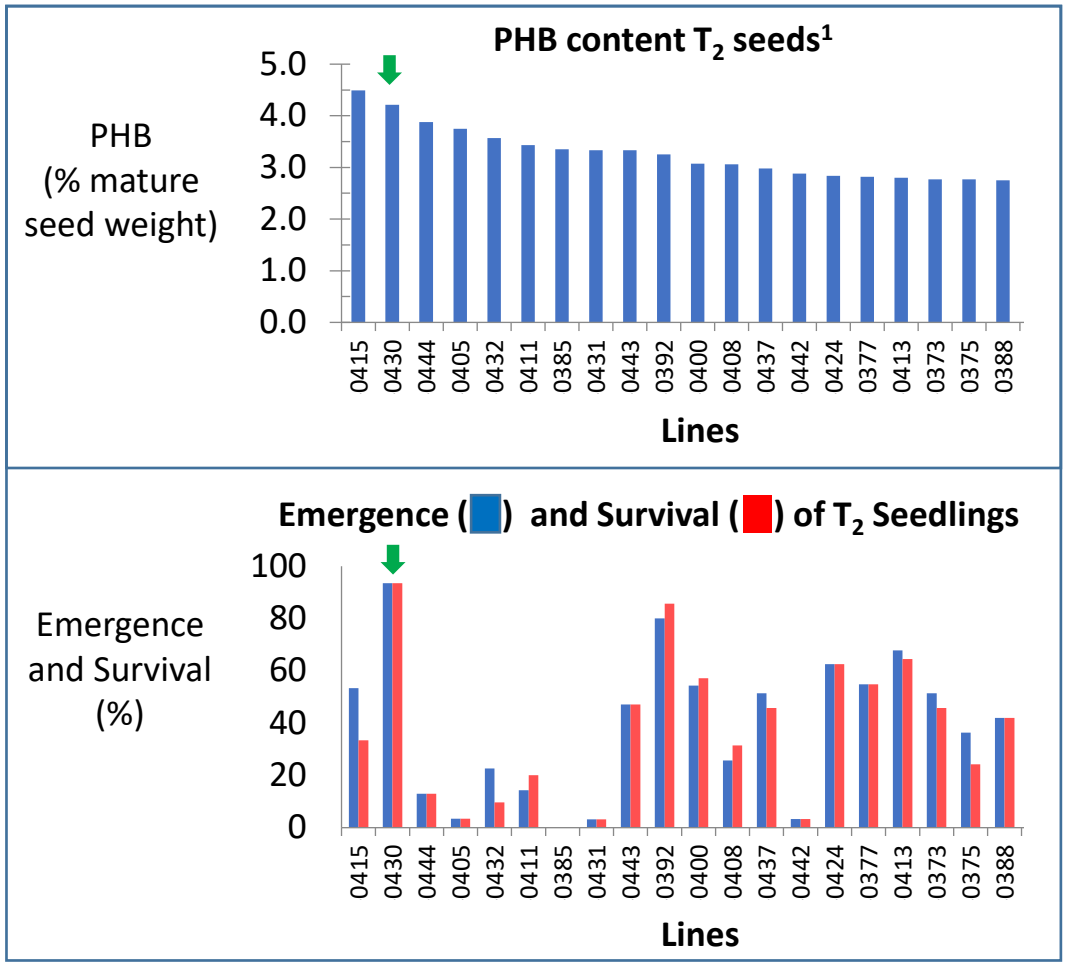
ketothiolase (PhaA), **reductase** (PhaB), **PHA synthase** (PhaC)

T_2 Seed PHB Content and Survival of Seedlings

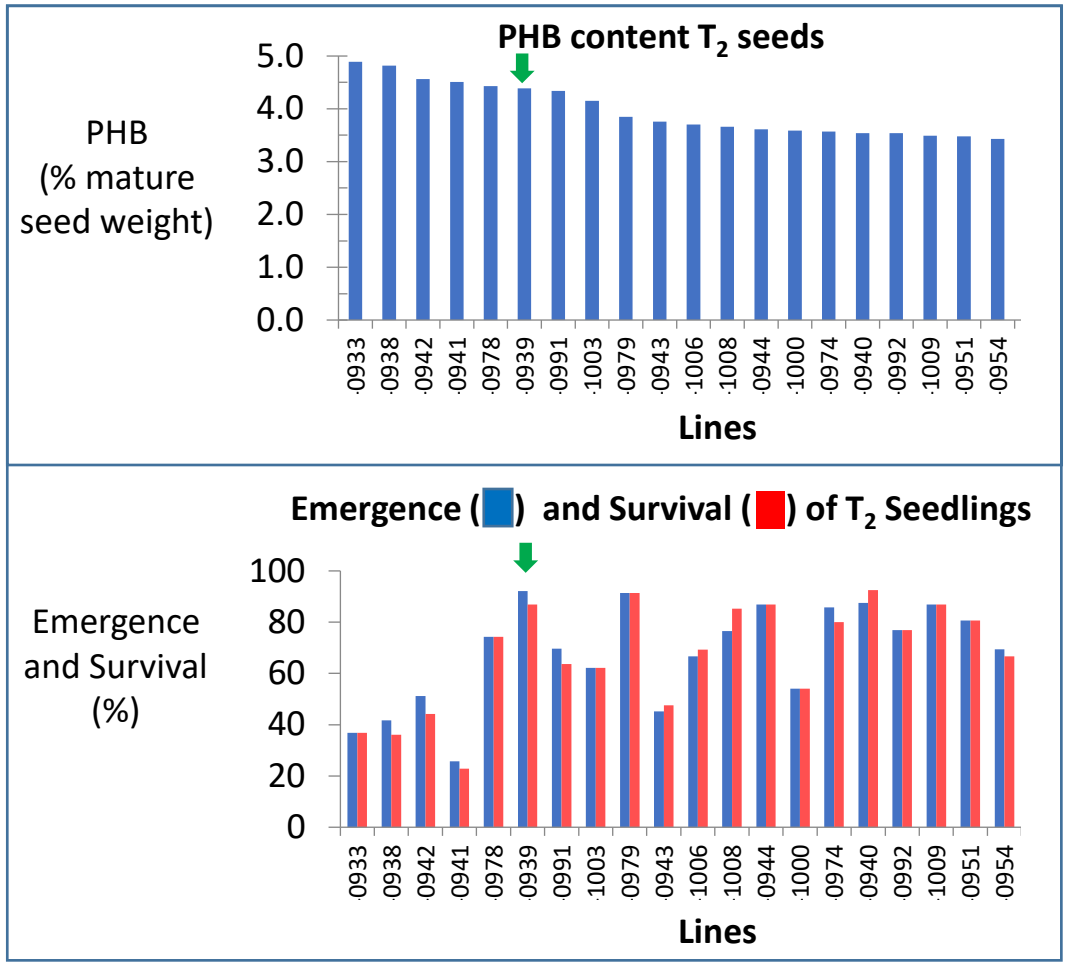
Second generation (T_2) seeds contained up to 14x reported[1] highest level of cytosolic PHB

- Some lines with good emergence and survival contained > 4% PHB (mature seed weight)

Cytosolic PHA synthase



ER anchored PHA synthase

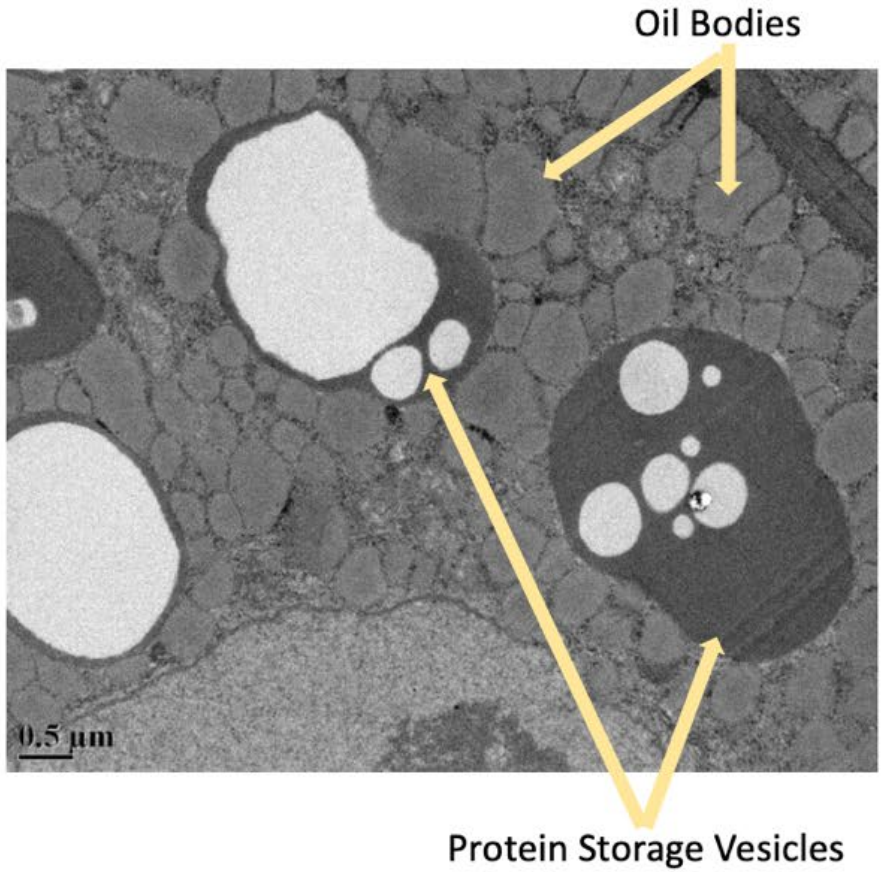


[1]**Production in cotton fibers, 0.34% dry cell weight, John & Keller,** 1996, *P. Natl. Acad. Sci. USA.* 93, 12768.

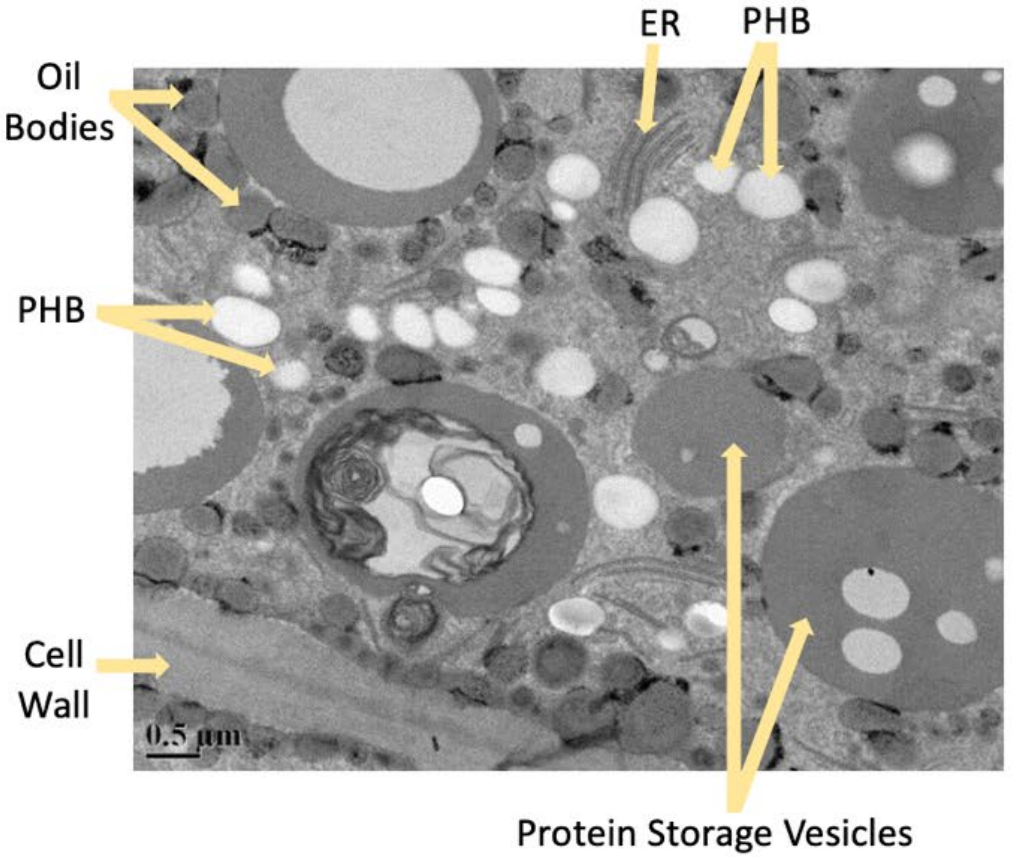
PHB Polymer Accumulates as Granules in Seed

Transmission electron microscopy (TEM) of cotyledon in imbibed seeds

Wild-type control



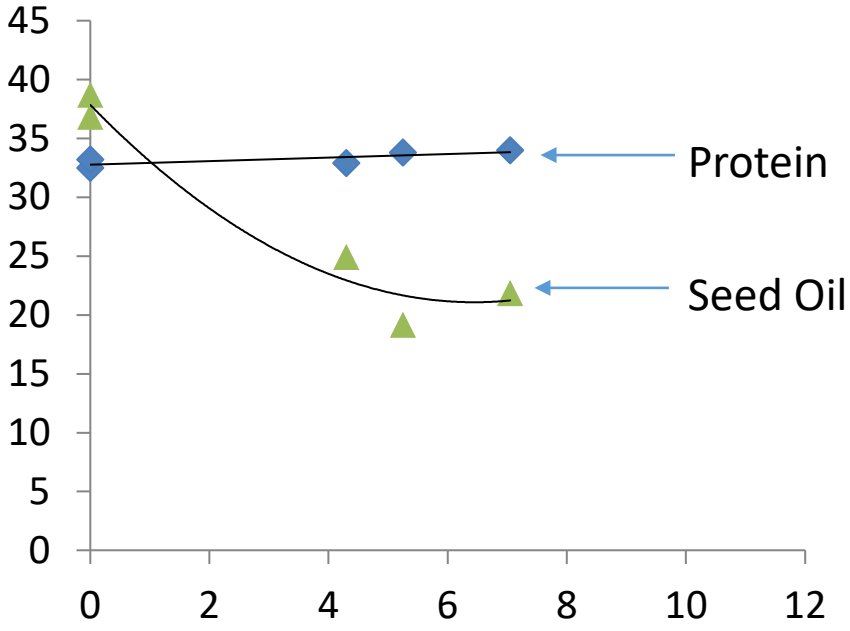
ER targeted synthase line



PHB Produced at Expense of Oil

Seed Oil and Protein Content
(from greenhouse growth of homozygous lines)

Seed Protein & Oil Content
(% mature seed weight)



PHB Content
(% mature seed weight)

PHB has more value than oil

Looking for genes to increase carbon to boost oil using GRAIN modeling platform

Seedlings of Cytosolic PHB Producers

Cytosolic PHB production in seeds ➡ healthy seedlings with narrow cotyledons

Wild-type

Cytosolic PhaC
4.5% PHB
53% emergence
33% survival

ER PhaC
4.4% PHB
92% emergence
87% survival

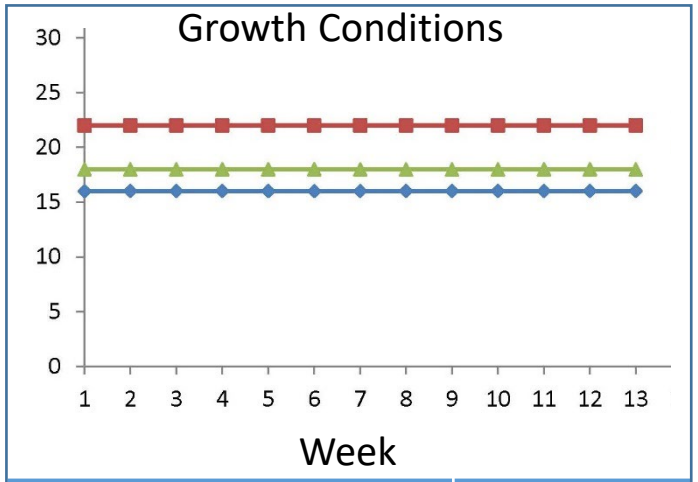
Pursued only ER PhaC lines in later generations. PHB production more stable in ER PhaC lines.

PHB Production in Different Growth Conditions

Lines grown in greenhouse and controlled environmental chamber programmed to simulate average spring growth conditions[1]

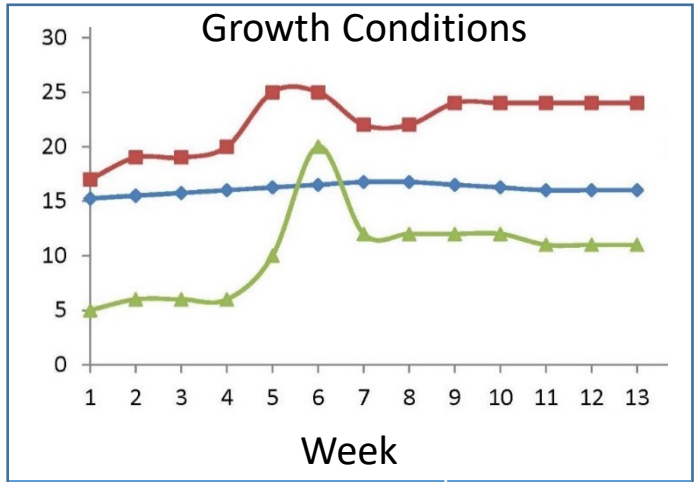
- Results for best line shown

Greenhouse



T_4 seed PHB range	3.9 - 7.1%
% survival T_3 seedlings	86
Avg T_4 seed yield (g)	8.2 ± 1.8
Number of plants	8

Controlled Environmental Chamber



T_4 seed PHB range	4.6 -10.2%
% survival T_3 seedlings	78
Avg T_4 seed yield (g)	14.7 ± 3.9
Number of plants	4[2]

Up to 10.2% PHB obtained in seeds of homozygous line in chamber - 30X highest previously reported level [3]

[1]Temperature settings in controlled environmental chamber adapted from average weekly historical data between early May & late July for Saskatoon, Saskatchewan, Canada. [2]Size of growth chamber limited number of replicates. [3]Production in cytosol of cotton fibers 0.34% dry cell weight, John & Keller, 1996, P. Natl. Acad. Sci. USA. 93, 12768.

Field Trials of Prototype ER Targeted PHB Lines

2020
Replicated field plots, line sorting

PHA Camelina plants, U.S. field test site
6% PHB produced in best line

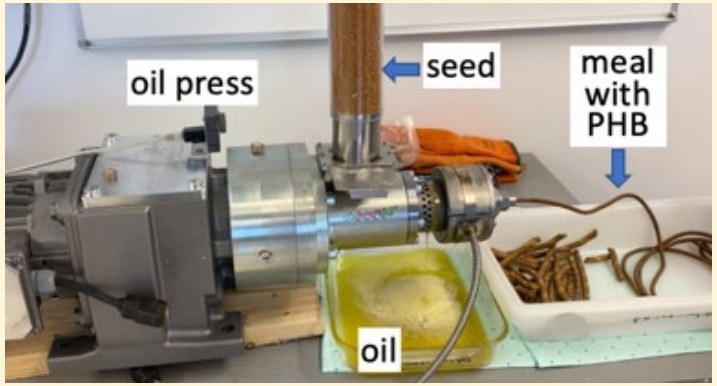
2021
0.2 acre seed scale up

Drone photo, U.S. scale up site
Plants produced 6% PHB

2022
Acre-scale seed scale up

Maturing plants, U.S scale up site
Seed harvested, PHB will be measured

Small scale seed processing from field



Seed crushing with oil press, removal of oil

Prototype PHA Camelina products

PHB polymer[1] Seed oil Protein rich meal[1]

Seed processing, product prototyping, sampling & other business development activities

[1]After solvent extraction of PHB containing meal

PHA Trait Leverages Elite Camelina Platform - Address High Value Markets

PHA Market Opportunity

Growing global demand for biobased polymers

Development Highlights and Milestones

- **Pilot scale activities, prototype ER targeted PHB line**
  - Produced seed at acre-scale. Will isolate PHA for process development and product sampling
- **PHA trait optimization R&D targets**
  - Increase PHA content to 10-20% of seed weight
  - Demonstrate co-polymer production
  - Field test PHA winter Camelina lines
  - Combine PHA trait with traits required for farmer to grow Camelina (*herbicide tolerance/disease resistance*)
- **Pursue collaborations with industry**

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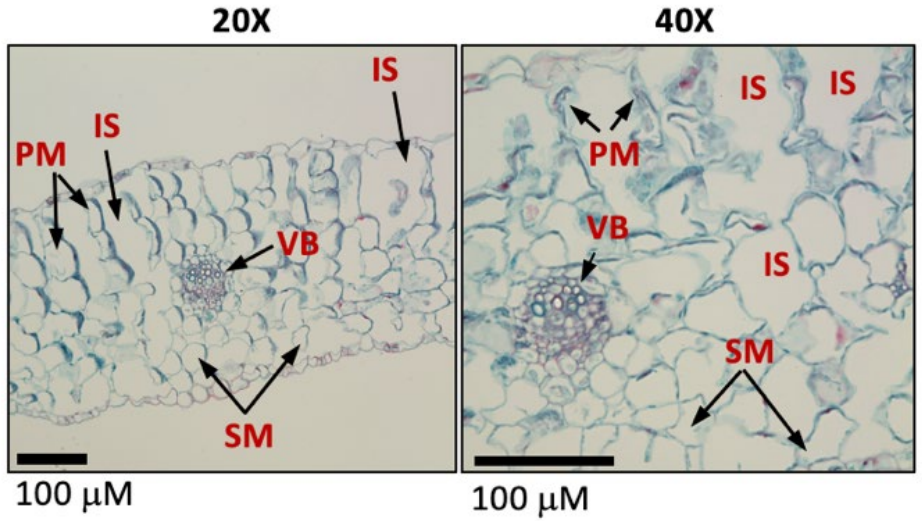
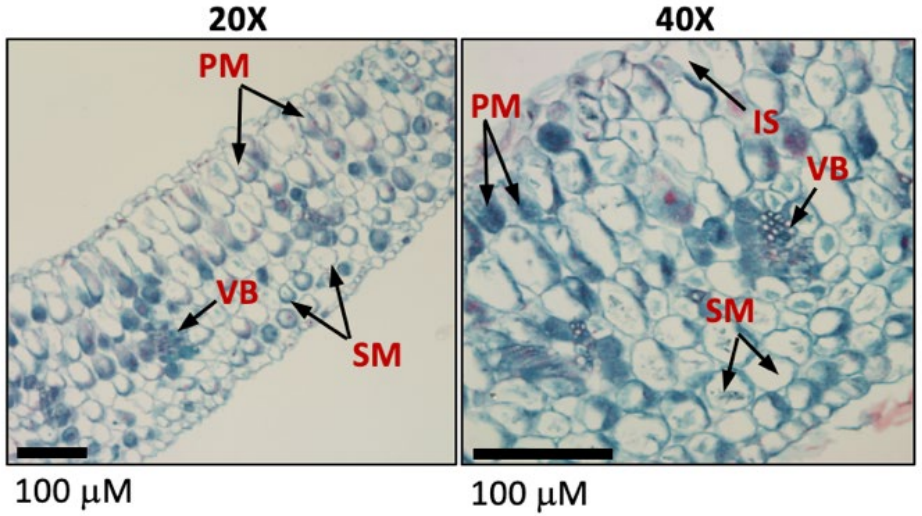
Wild-type



ER PhaC



Intercellular spaces significantly reduced in cotyledons of PHB producing lines

IS, intercellular space; PM, palisade mesophyll; SM, spongy mesophyll; VB, vascular bundle