



Plant-produced enzymes for improved animal nutrition and bioethanol processing

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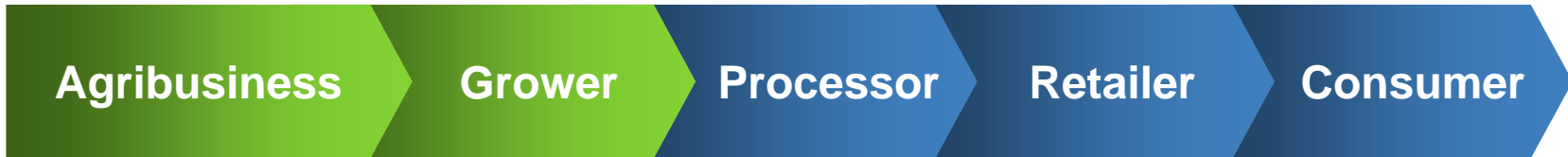
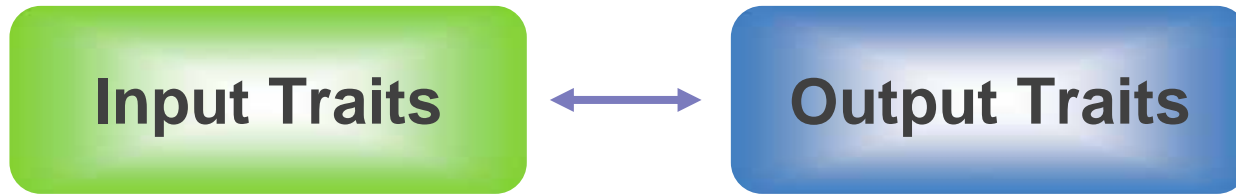
Syngenta Biotechnology, Inc

ABIC 2006, Melbourne

August 7, 2006



Having proven its value for farmers, ag biotech is being applied to an increasing number of other areas



- Lower Production Costs
- Increased Yields
- Promote No/Low-Till Practices

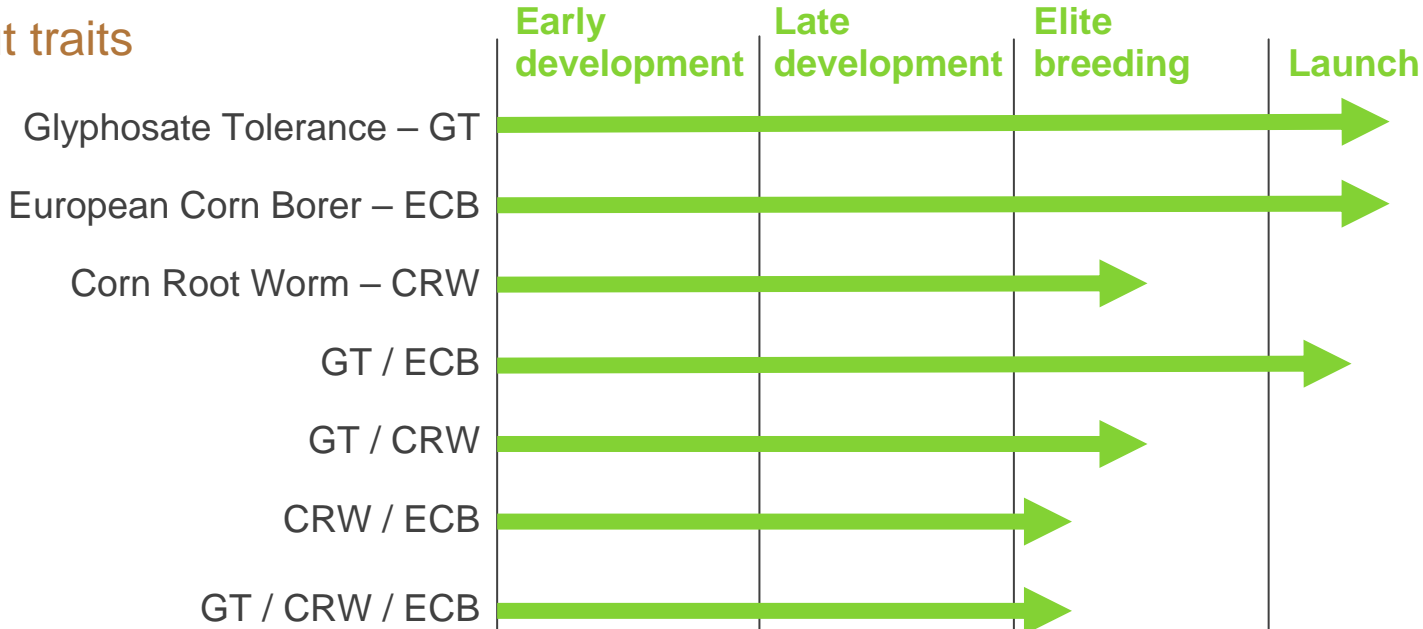
Making farmers more efficient

- Food/Feed Processing Benefits
- Healthy, High Quality Foods
- Nutritionally Enhanced Feed
- Improved Bioprocessing Benefits

New sources of value

Syngenta corn traits development pipeline

Input traits



Output traits

Biofuels

Corn amylase

Animal feed

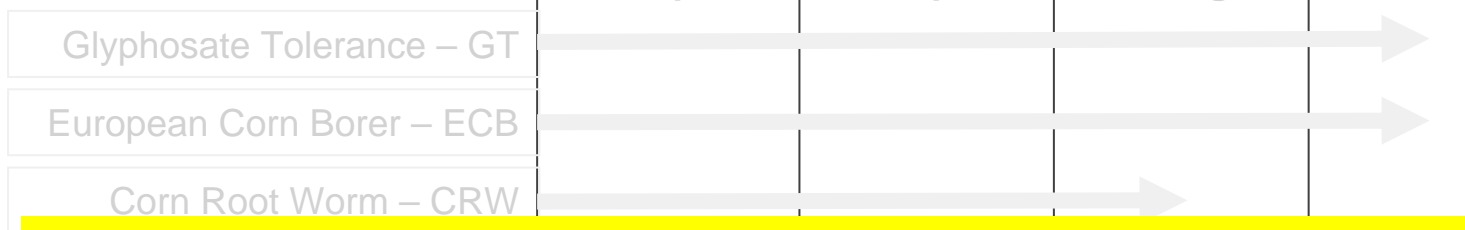
Microbial Quantum™

Corn phytase

Syngenta corn traits development pipeline

Input traits

	Early development	Late development	Elite breeding	Launch
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While first generation input traits were focused on food and feed production we are increasingly realizing the potential of enzymes expressed in crops to make industrial processes more efficient.

Output traits

Biofuels



Animal feed



Acknowledgements

Lot of work from a lot of people

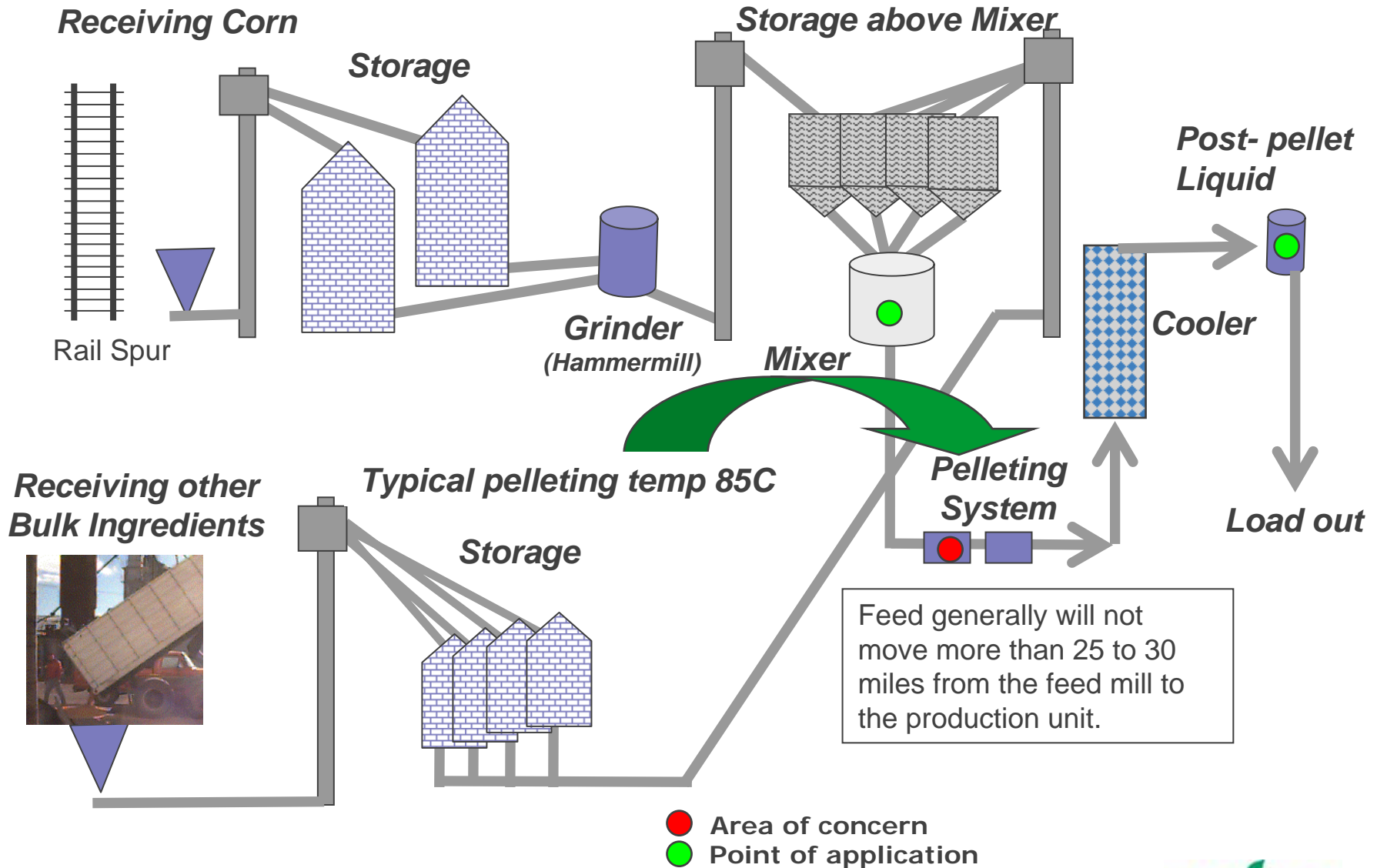
Collaboration between Syngenta and Diversa Corp.

Example: Corn-expressed phytase enzyme to enhance feed production and animal performance

Phytase enzyme additives have revolutionized animal feed production, but have their limitations

- ❑ Plant phytate is bound and generally unavailable to the animal
- ❑ Animals lack endogenous phytase to break down phytate
- ❑ Currently addressed by adding inorganic P to account for unavailable phytate or by adding supplemental phytase enzyme to free phytate from corn and soy diets
- ❑ *Neither option is ideal as inorganic P can be expensive and/or environmentally unsustainable while first-generation phytase additives are susceptible to loss of efficacy from heat-pelleting*

Poultry Broilers – Typical feed mill operations



Quantum™ Phytase

- Quantum Phytase animal feed additive
 - Increased thermostability to withstand pelleting process
 - Increased GI availability
 - Increased weight gain
 - Reduced phosphate pollution
- Commercially available in Mexico, Canada and other key markets. In US registration system.
- Corn Phytase: expected launch 2010

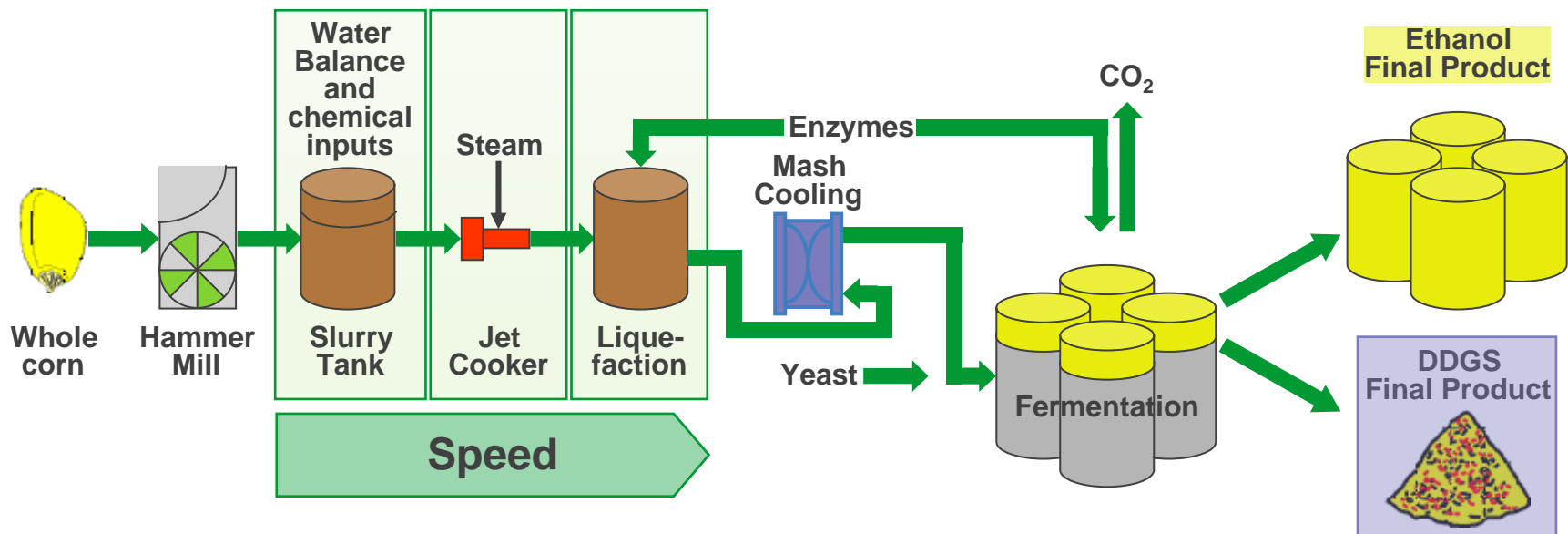
The logo for Quantum features a stylized grid of blue and yellow squares to the left of the word "Quantum" in a bold, green, italicized sans-serif font. Below the text is a horizontal line of green dots.

Example: Corn Amylase for Increased Biofuels Production

The global growth in biofuels is rate limited at present

- ❑ Global energy demand is expected to increase 60% by 2030
- ❑ Biofuels is a viable substitute for petroleum products for transport
- ❑ Biofuels held to address environmental concerns
- ❑ Energy security is a concern for countries around the world
- ❑ *Despite this demand, moving beyond 5% substitution at today's levels will begin to stress the food and feed chain. New inputs and processing technologies will be needed, e.g. the conversion of biomass to ethanol*

Corn Amylase as a corn ethanol processing breakthrough



Conventional dry grind process

- Majority of installed capacity
- Moderate use of conventional enzymes

Potential breakthrough with Corn Amylase

- Significantly improves dry grind value performance
- Matches many benefits of raw starch technology
- Decouples value from current standard enzymes

Summary

Plant-produced enzymes add significant value and dramatically change how we think about “output” traits.

...The engineered enzymes use their own manufacturing plant (corn in the examples shown) as their substrate...

...High expression levels of the enzymes allow “admix” opportunities...

...”Self processing plants”...