

Distillers Co-Products Animal Feed Updates Research Perspective

B. W. Parsons

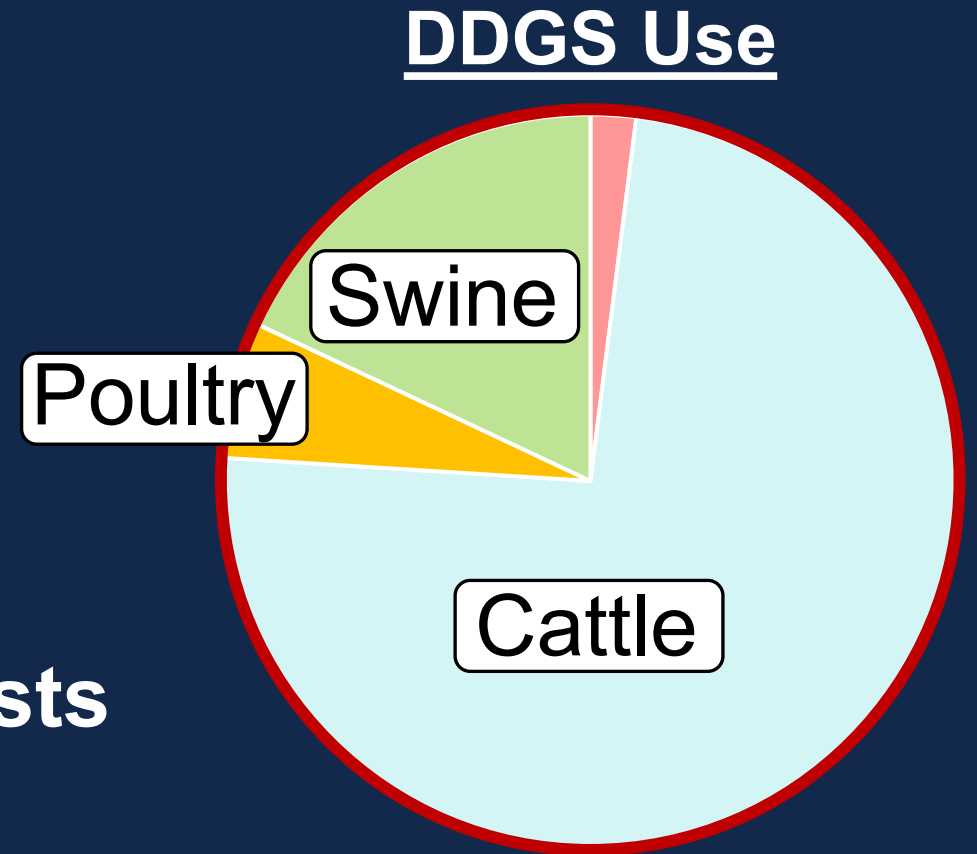
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Overview

- **1. Current DDGS usage in livestock diets**
- **2. Nutritional value of DDGS**
- **3. Improvement in nutritional value due to new technologies**

Current DDGS Usage in Livestock Diets

- DDGS usage in poultry is less than cattle and swine
 - Usage varies among companies and nutritionists



RFA, 2023

Key Factors Regulating DDGS Usage

1 Price / availability

2 Available nutrient content

- Energy
- Amino acids
- Phosphorus

Key Factors Regulating DDGS Usage

- 1** Price / availability
- 2** Available nutrient content
- 3** Consistency
- 4** Flowability / pellet quality
- 5** Mycotoxins

Metabolizable Energy

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Gross Energy

= Total energy in feed

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Gross Energy

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Remove energy lost in feces

Digestible E.

Metabolizable Energy

Gross Energy

= Total energy in feed



Remove energy lost in feces

Digestible E.



Remove energy lost in urine / gas

Metabolizable E.

Metabolizable Energy Content of OLD DDGS (kcal/kg; ≈88% DM)

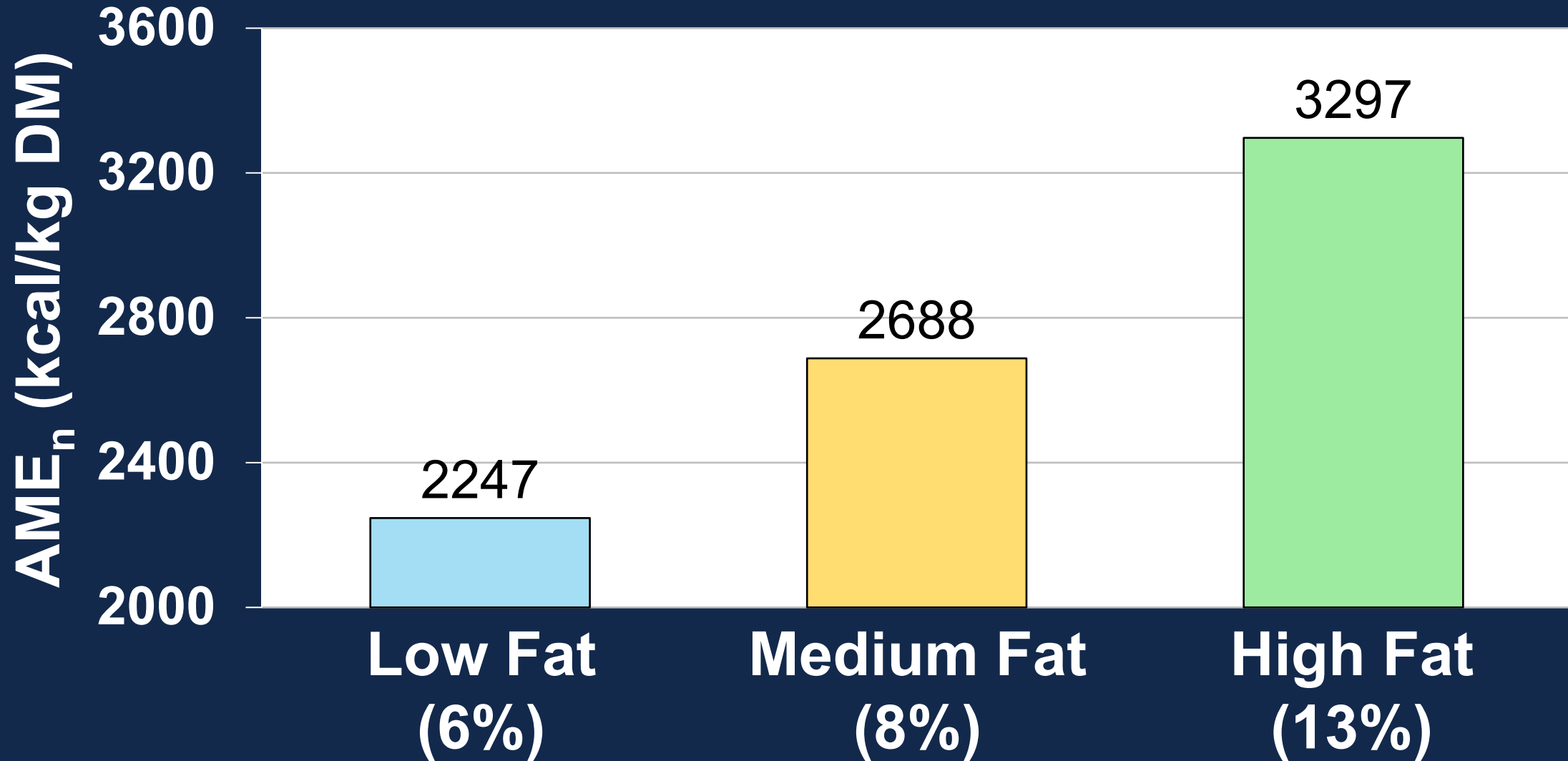
Study	# of samples	Mean TME _n	Range
Lumpkins and Batal (2005)	1	2900	-
Batal and Dale (2006)	17	2820	700
Parsons et al. (2006)	20	2858	447
Fastinger et al. (2006)	5	2864	563
Weighted mean	43	2845	-

Summarized by Waldroup (2007)

Oil Content and Metabolizable Energy

- From a nutritionists perspective, oil in corn co-products is very valuable:
 - Oil is a dense calorie source (**9 kcal/g**)
 - Oil is highly digested by poultry (**often $\geq 90\%$**)

Effect of Oil on ME of DDGS



Meloche et al. (2014)

ME of Current DDGS is Lower Compared with Old DDGS

Study	# of samples	Crude fat (%)	Mean TME _n ¹
Parsons et al. (2023;2024)	6	6.8	2,592

¹kcal/kg 88% DM basis

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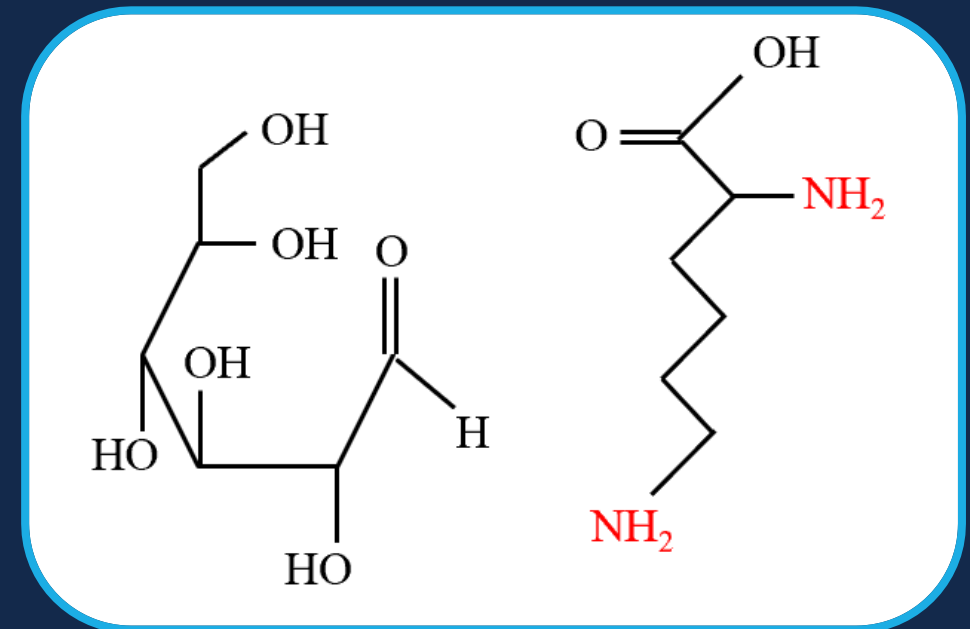
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3 percentage unit reduction in fat
250 kcal/kg reduction in ME

Amino Acids

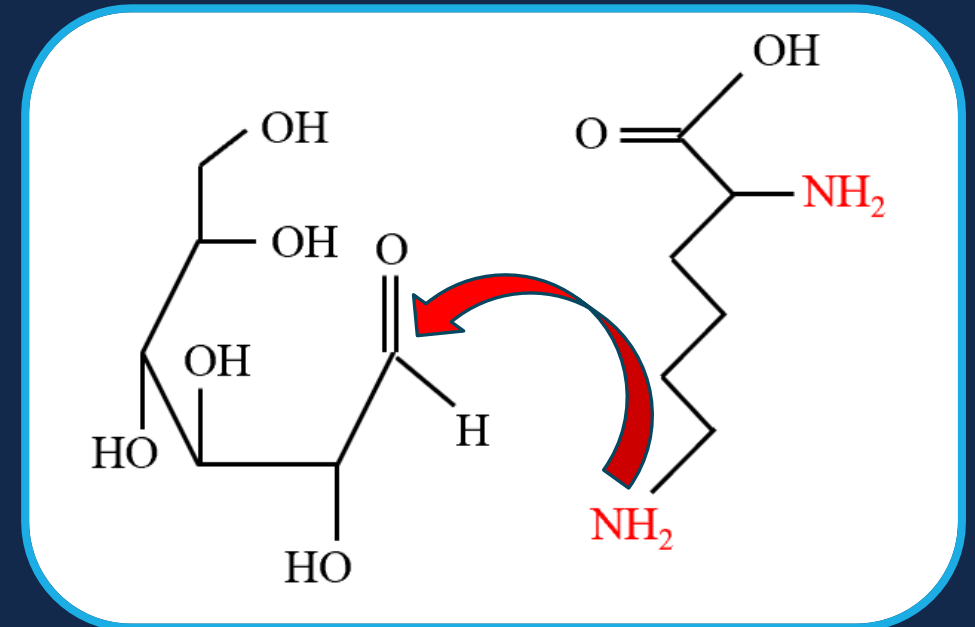
Amino Acid Digestibility

- DDGS is high in SAA, but low in Lys, Trp, and Arg
- The 3 most limiting AA in broiler diets in U.S.:
 - Methionine + Cysteine
 - **Lysine**
 - Threonine

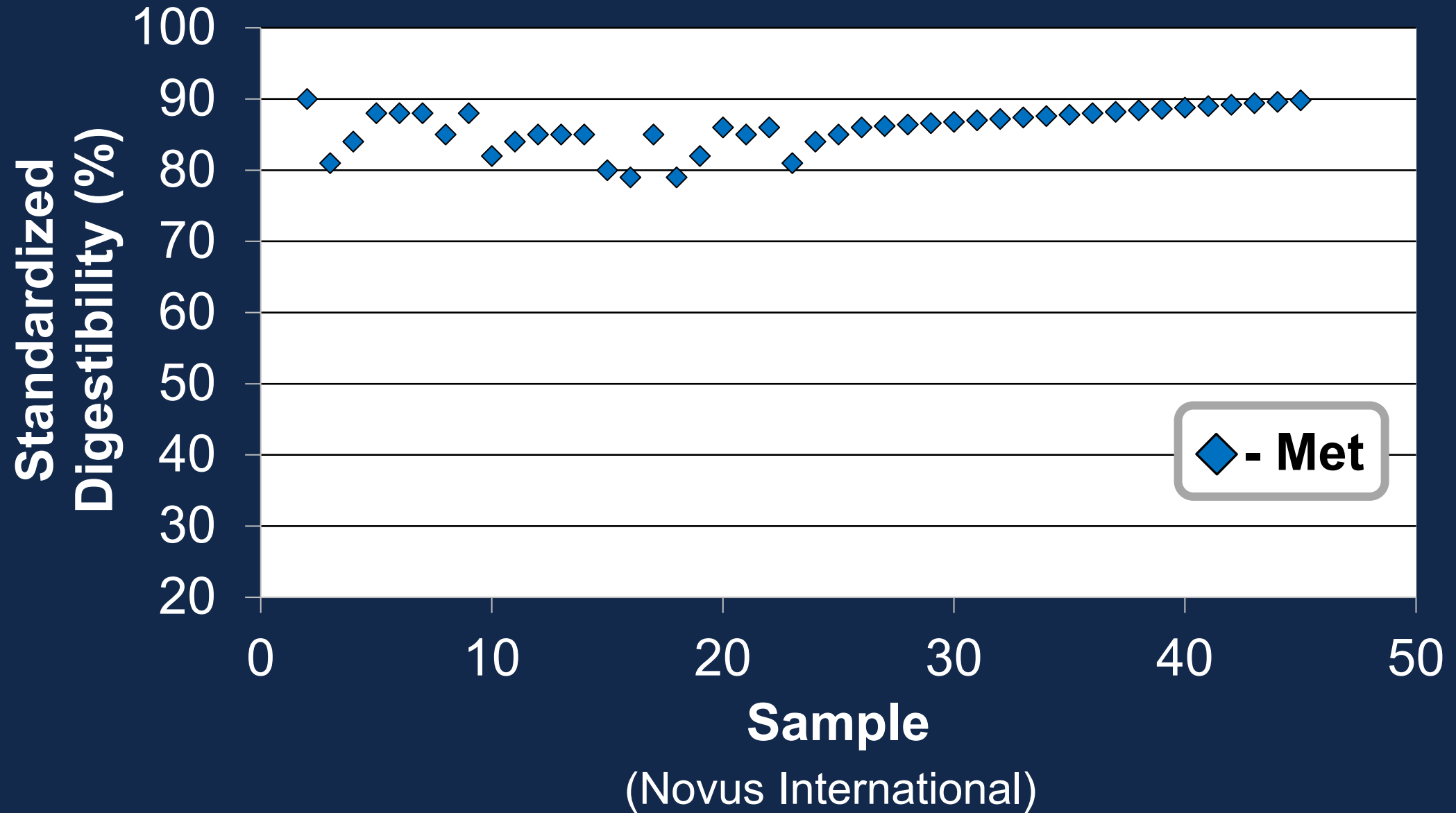


Amino Acid Digestibility

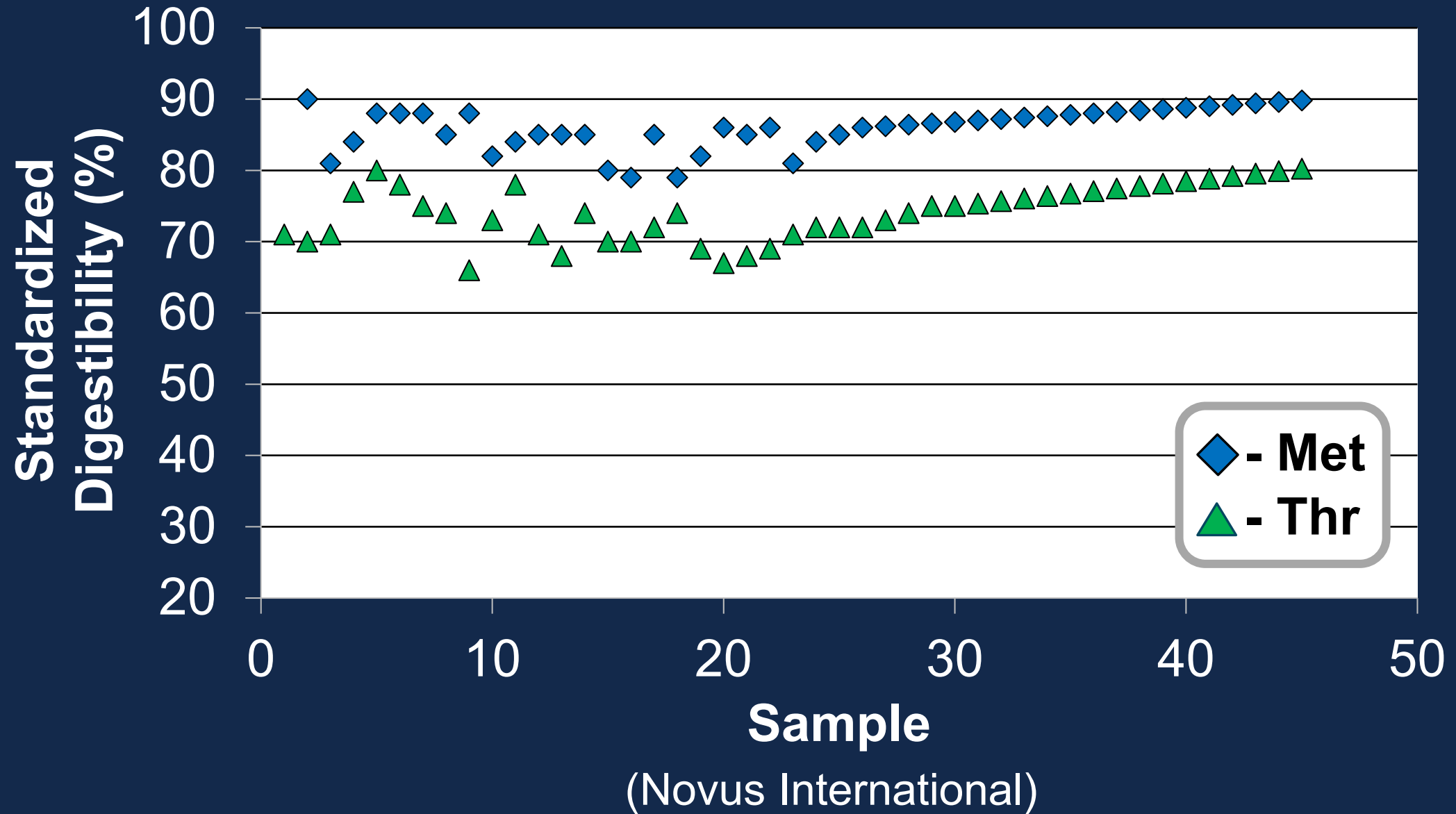
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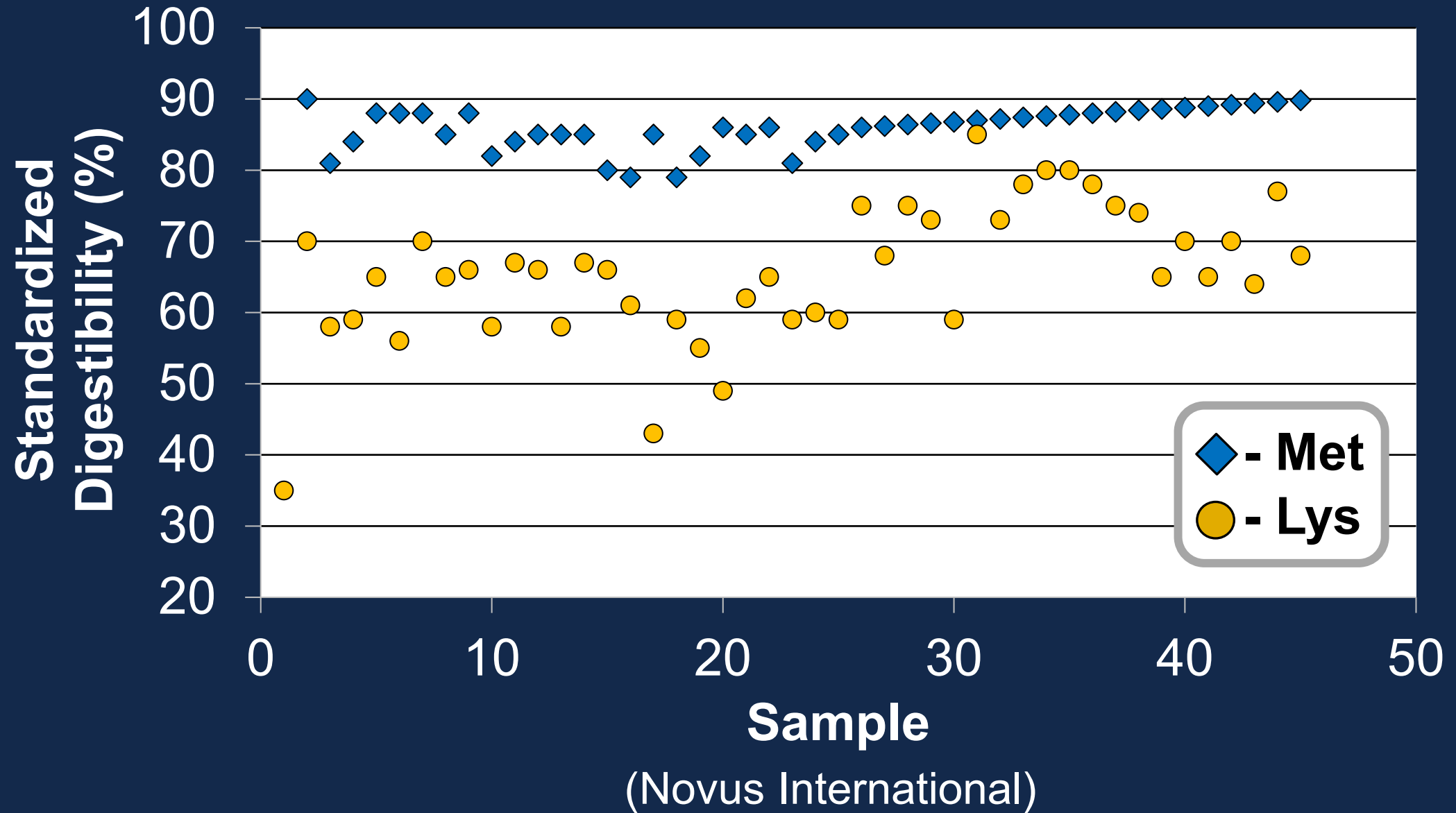
AA Digestibility in DDGS: Methionine



AA Digestibility in DDGS: Threonine



AA Digestibility in DDGS: Lysine

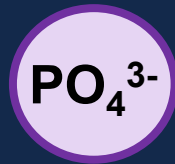


Phosphorus

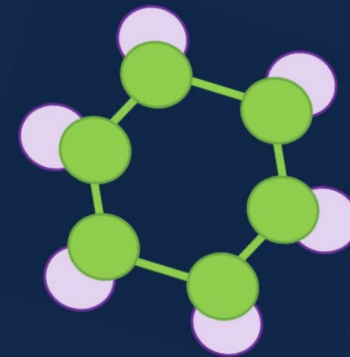
Phosphorus Availability

- After energy and AA, P is the next most costly nutrient
- As a rule of thumb, roughly 33% of P in plant-based feedstuffs is available for poultry

Plants:

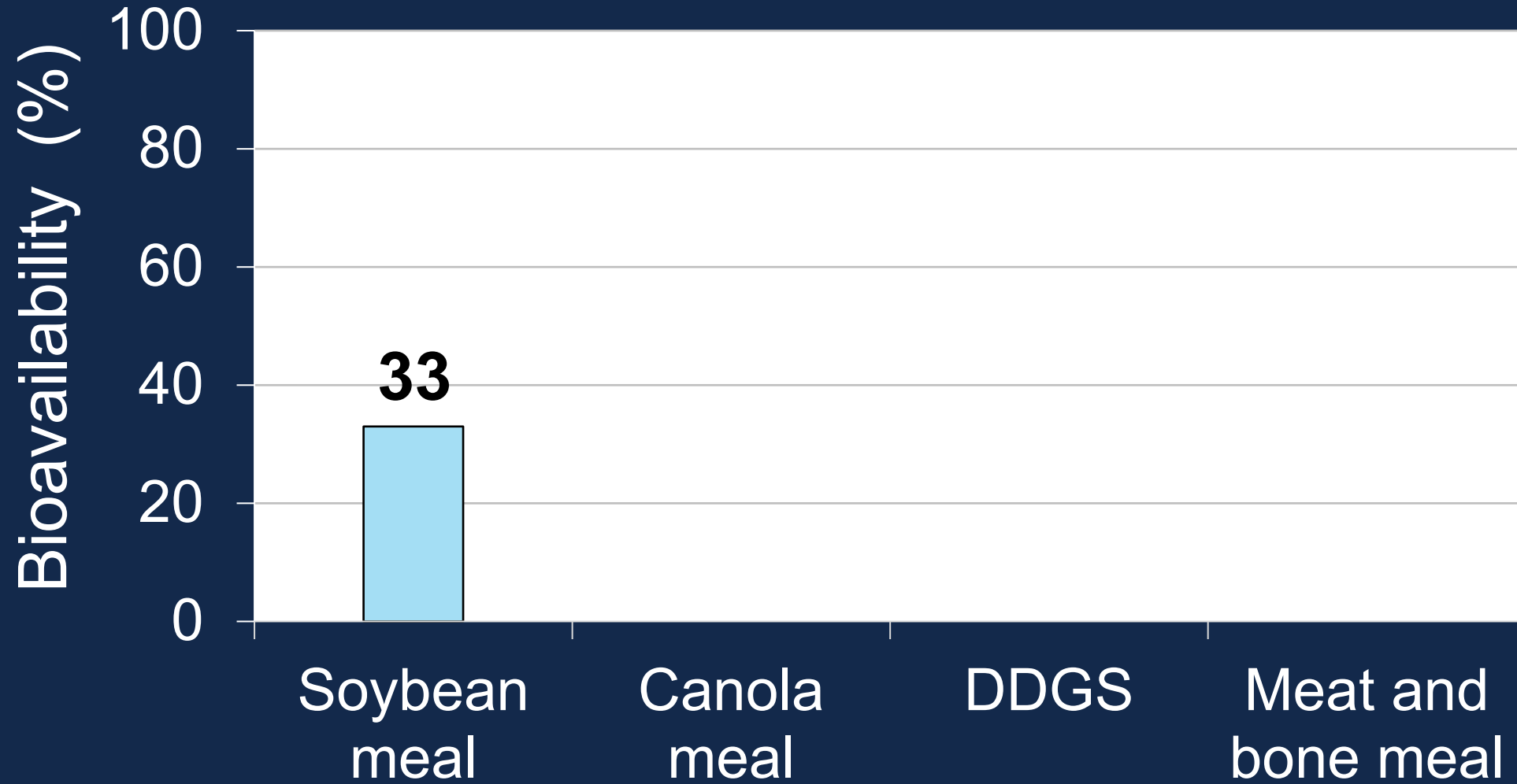


1/3 NPP



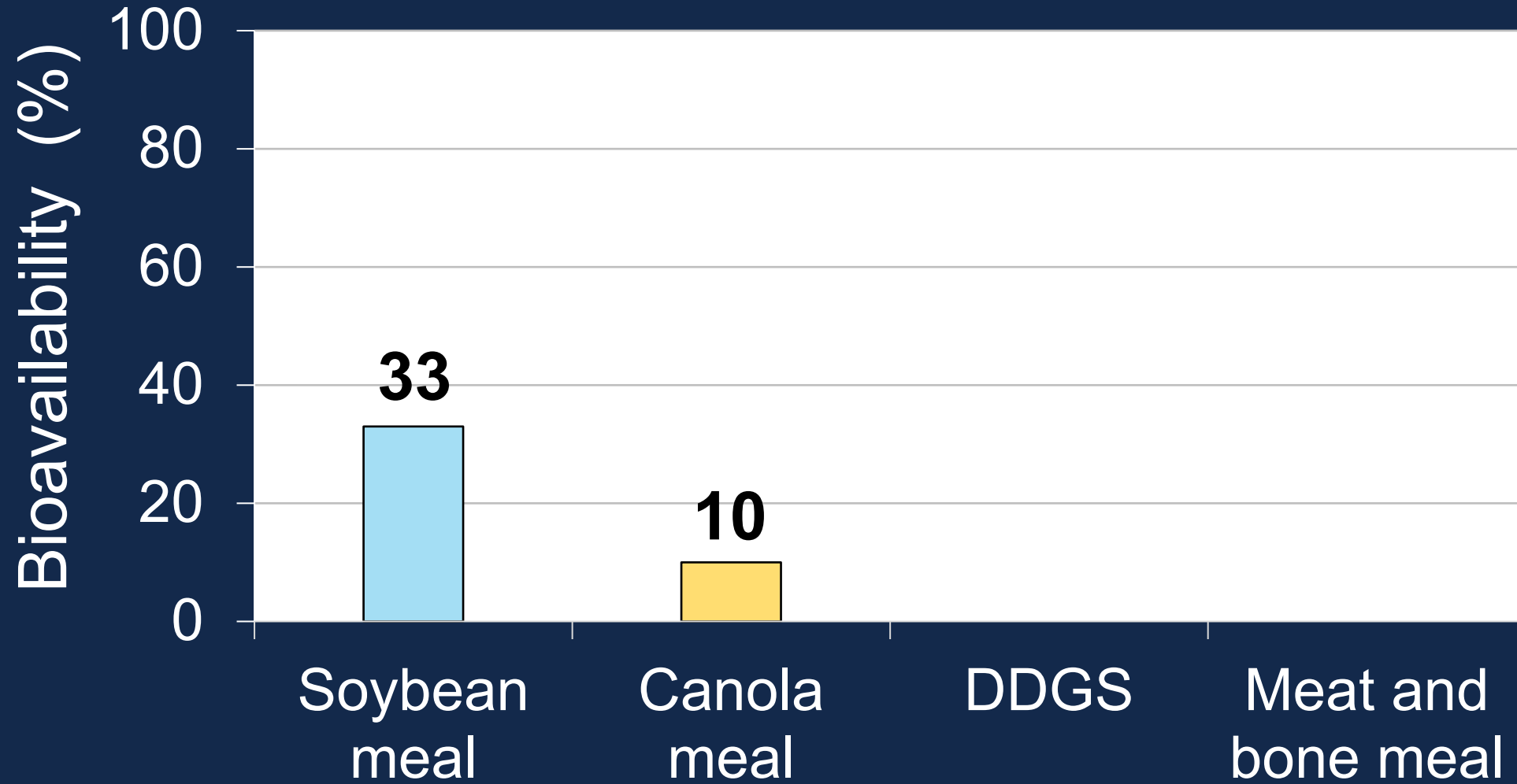
2/3 Phytate P

P Bioavailability in Feedstuffs



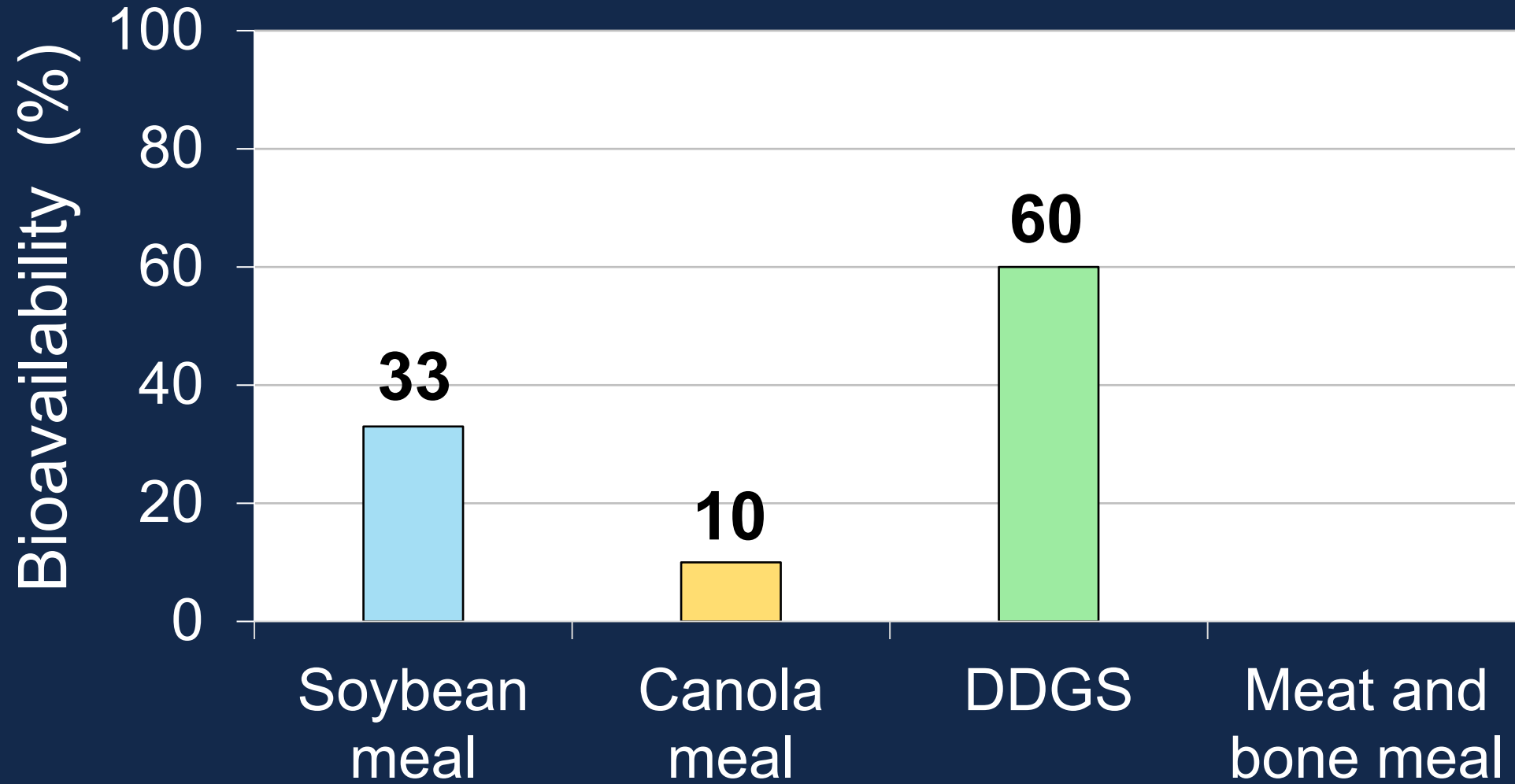
Hanna et al. (2018), Munoz et al. (2020), Parsons et al. (2023/2024)

P Bioavailability in Feedstuffs



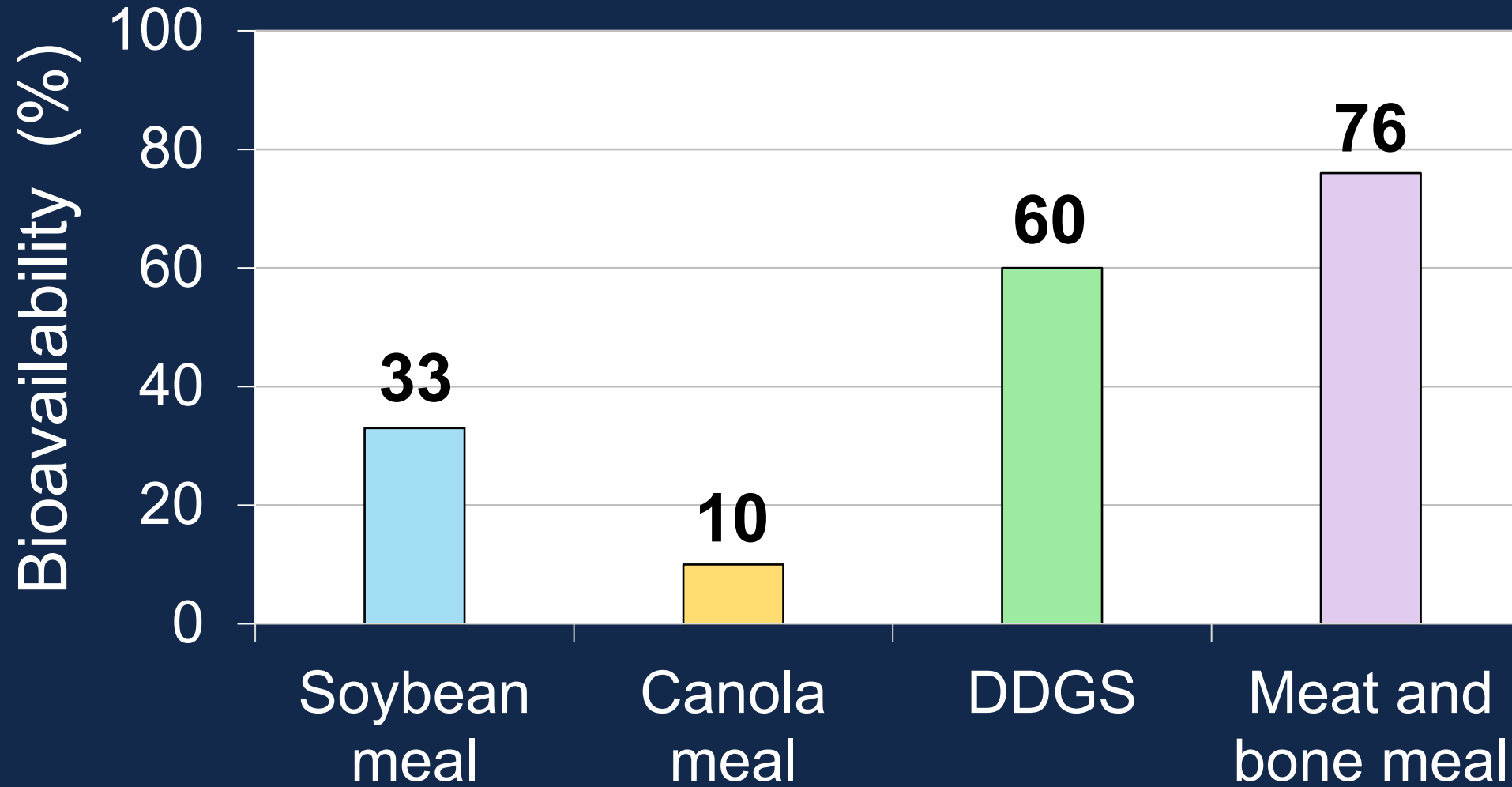
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Summary

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 - **Driven a lot by oil recovery**

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- **2. DDGS is a good source of SAA (Met+Cys)**
 - **Low and highly variable digestible Lys content**

Summary

- **1. ME content in DDGS has gone down over time**
 - **Driven a lot by oil recovery**
- **2. DDGS is a good source of SAA (Met+Cys)**
 - **Low and highly variable digestible Lys content**
- **3. Phosphorus in DDGS is much more available compared with other plant-based ingredients**

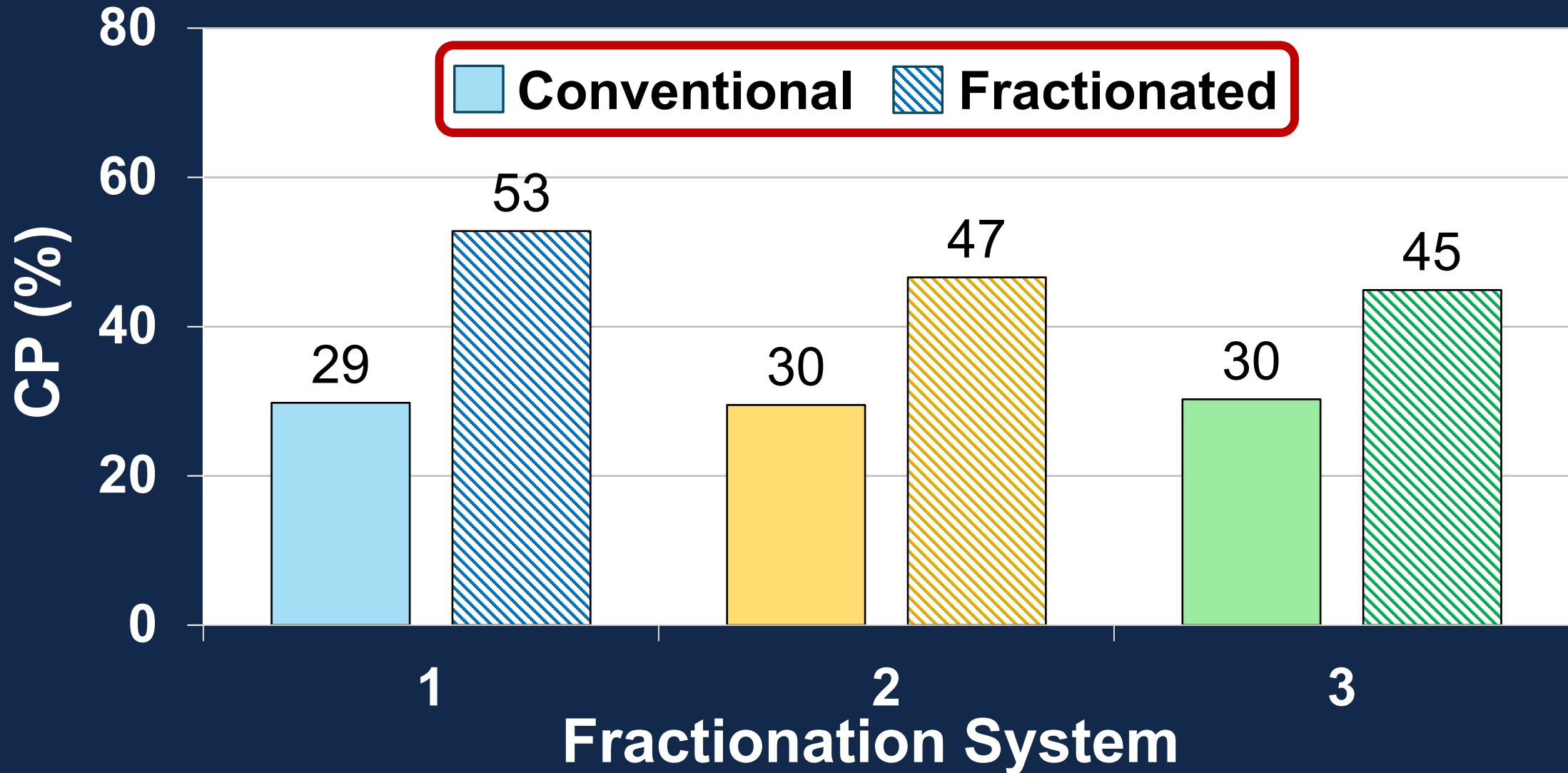
New Technologies/Updates:

1. Fractionation Systems

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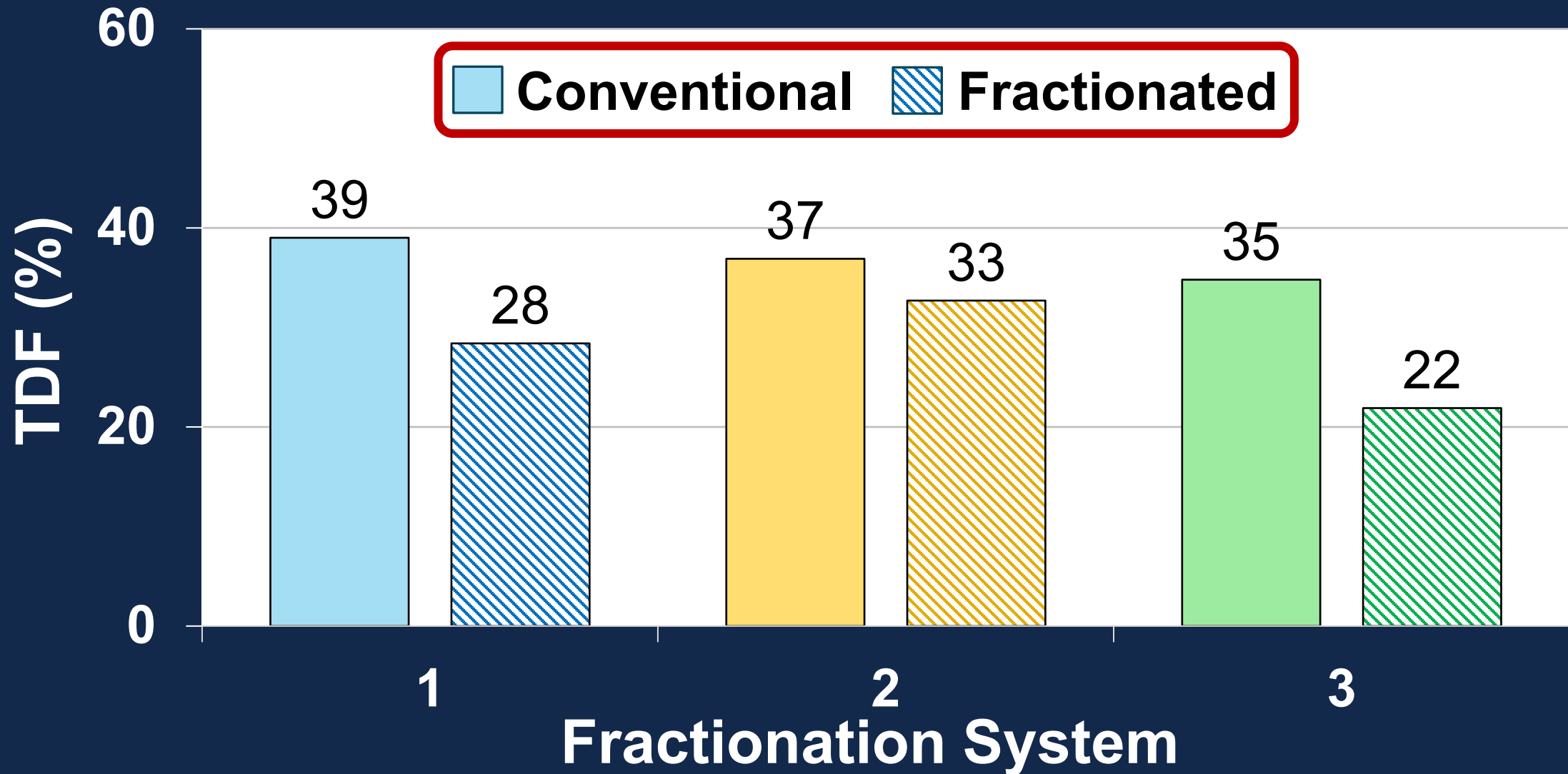
- **Fractionation systems increase protein and reduce fiber**
 - **Poultry are good at digesting protein**
 - **Fiber utilization: cattle > pigs > poultry**
- **Front-end vs. Back-end fraction**
 - **Variations among systems**
 - **Be mindful of what is being removed**

Increased Protein from Fractionation



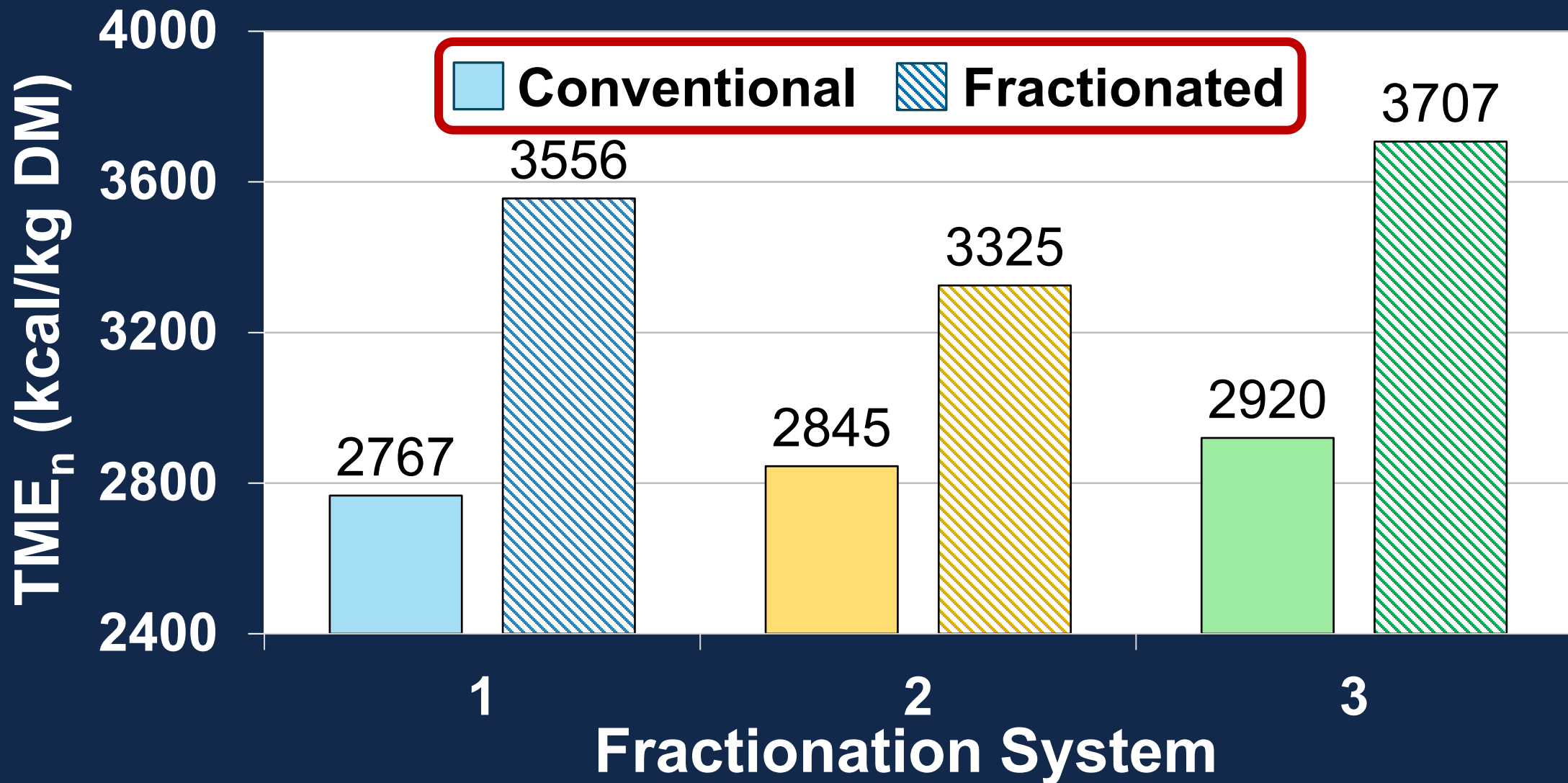
Parsons et al. (2023)

Reduced Fiber from Fractionation



Parsons et al. (2023)

Increased ME from Fractionation



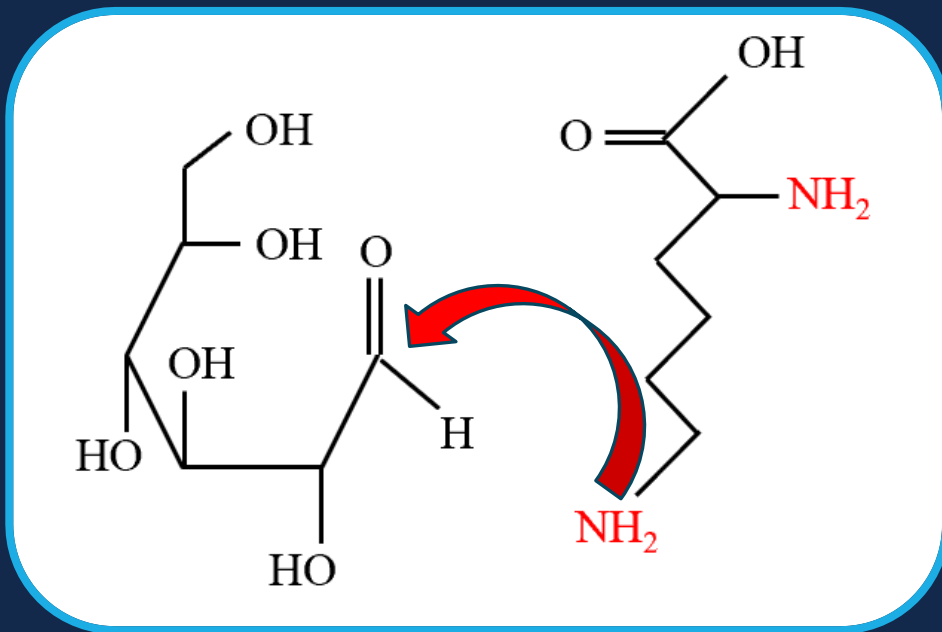
Parsons et al. (2023)

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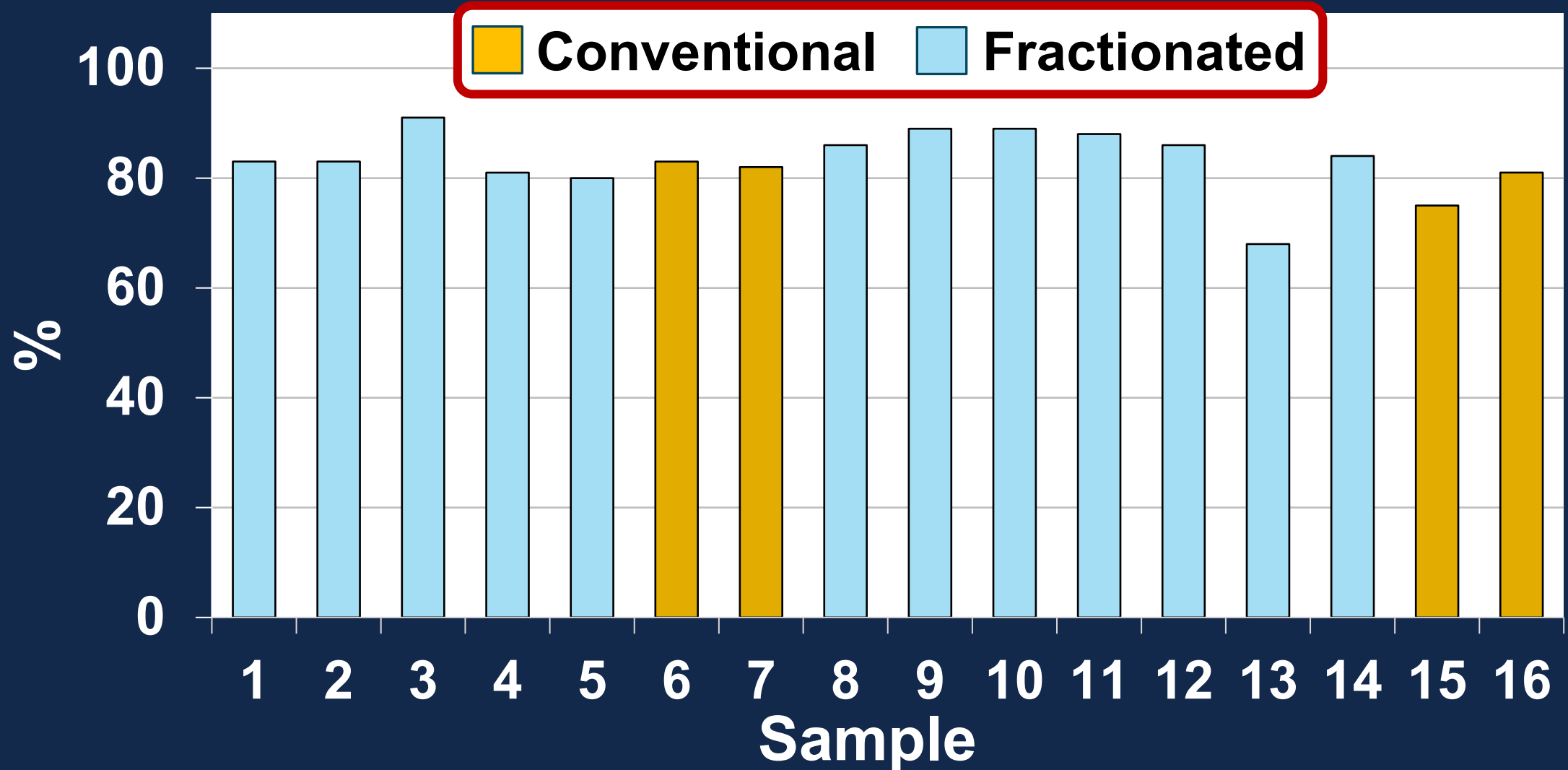
2. Milder Drying Processes

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- Historically we see reduced digestibility of **Lys** in pigs and chickens in DDGS due to heat damage

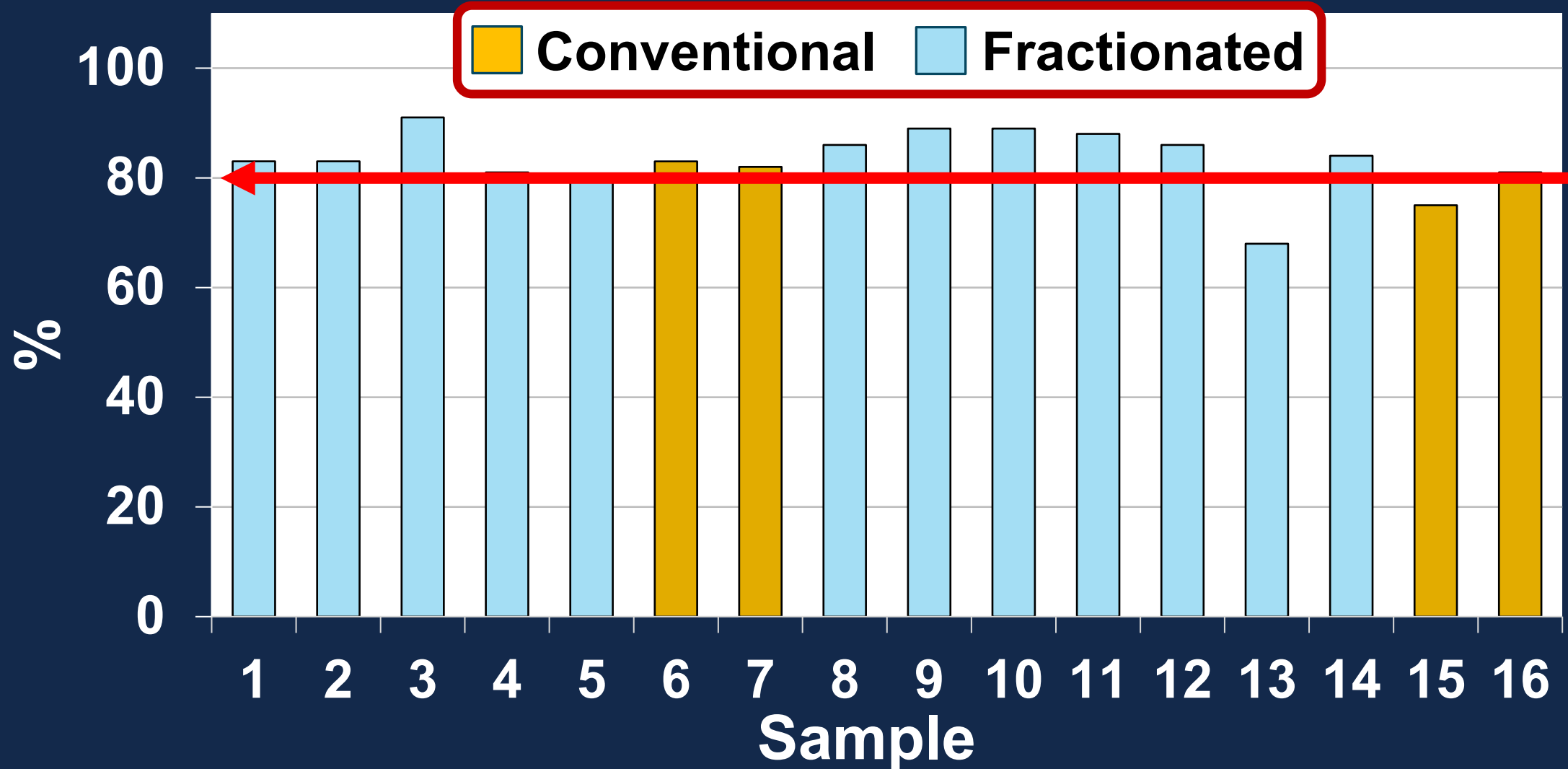


Lysine Digestibility



Parsons et al. (2023)

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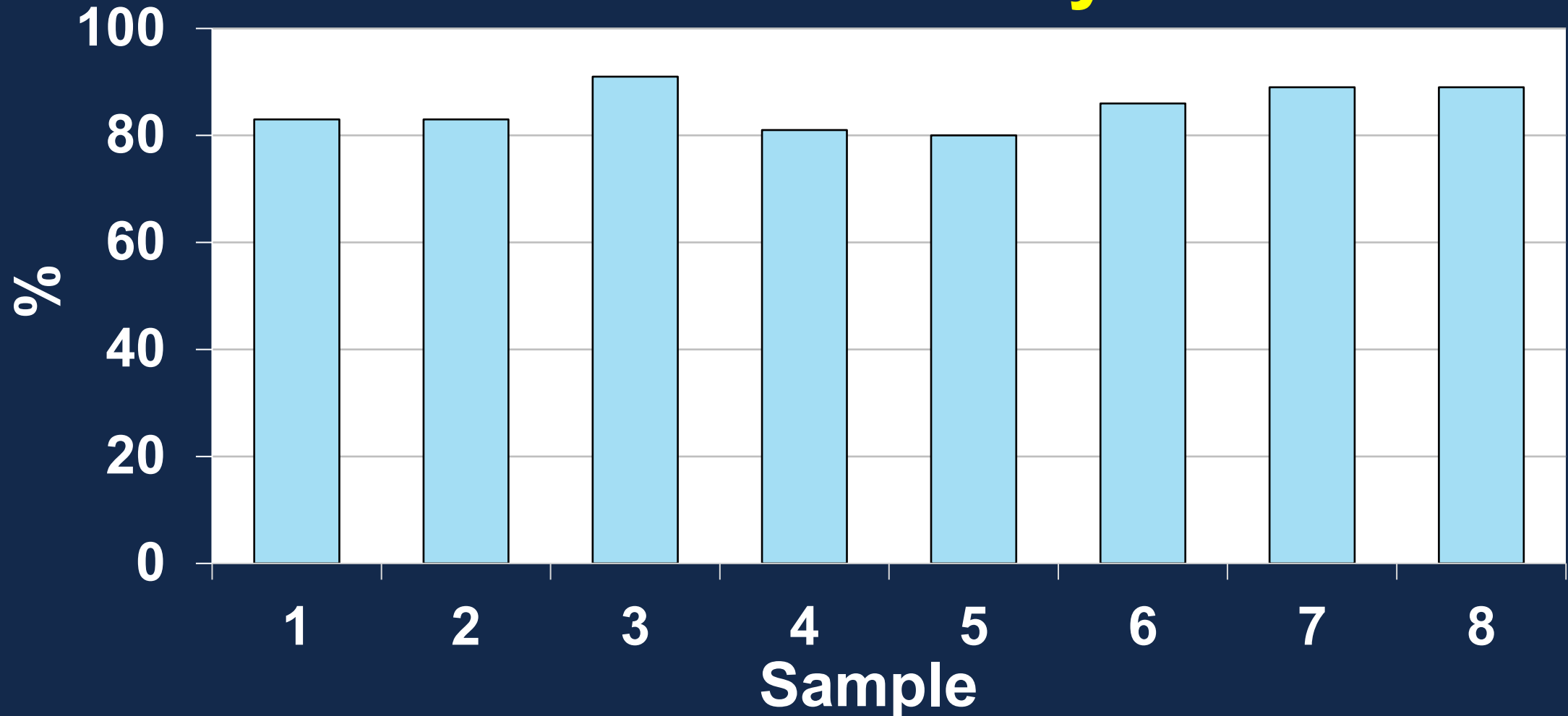
New Technologies/Updates:

3. Reduced Variability

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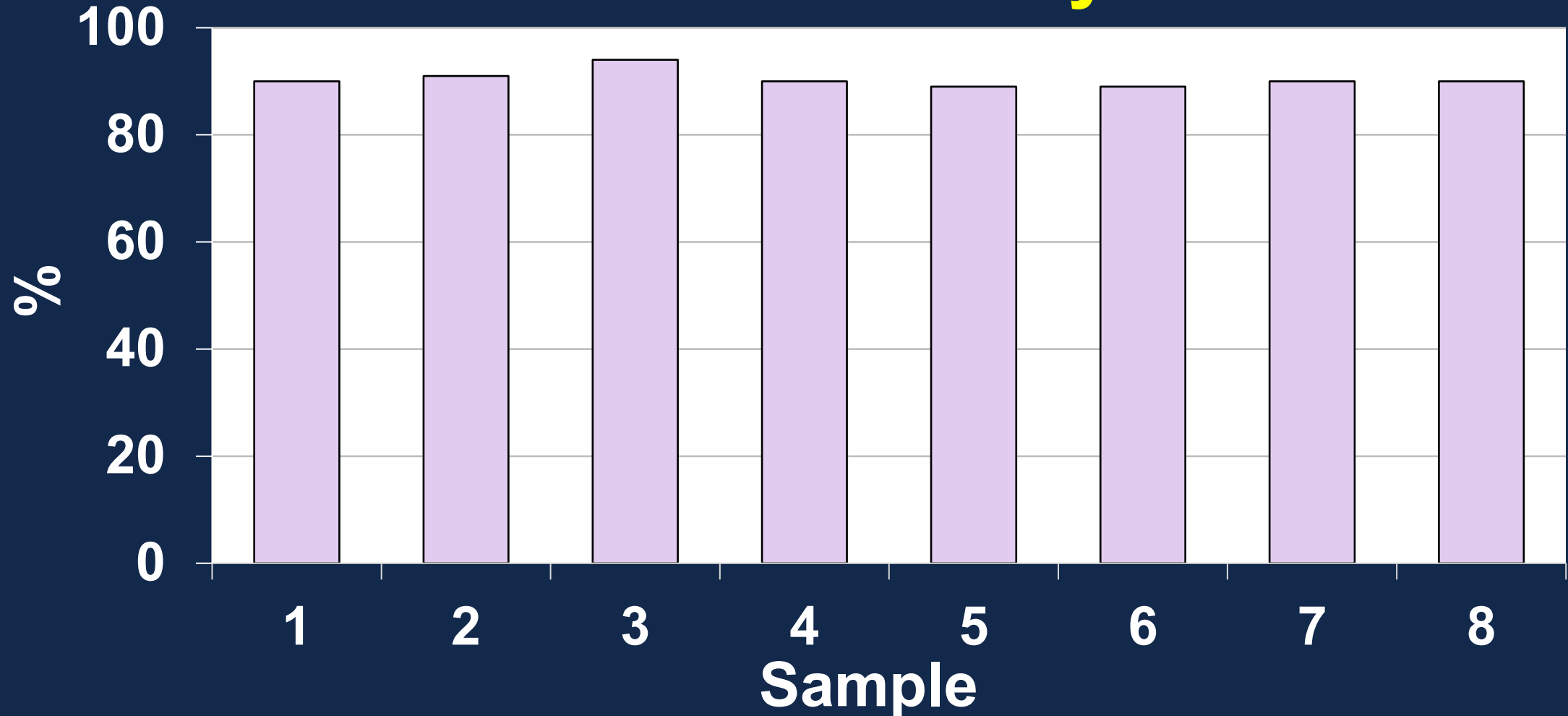
- Nutritionists are conservative with variable feedstuffs:
 - Limit the inclusion rate in diets
 - Use low end values
- Co-products from ethanol production appear to be more consistent now than in the past
 - Fractionation will alter remaining DDGS

Lys Digestibility of Samples from 1 Fractionation System



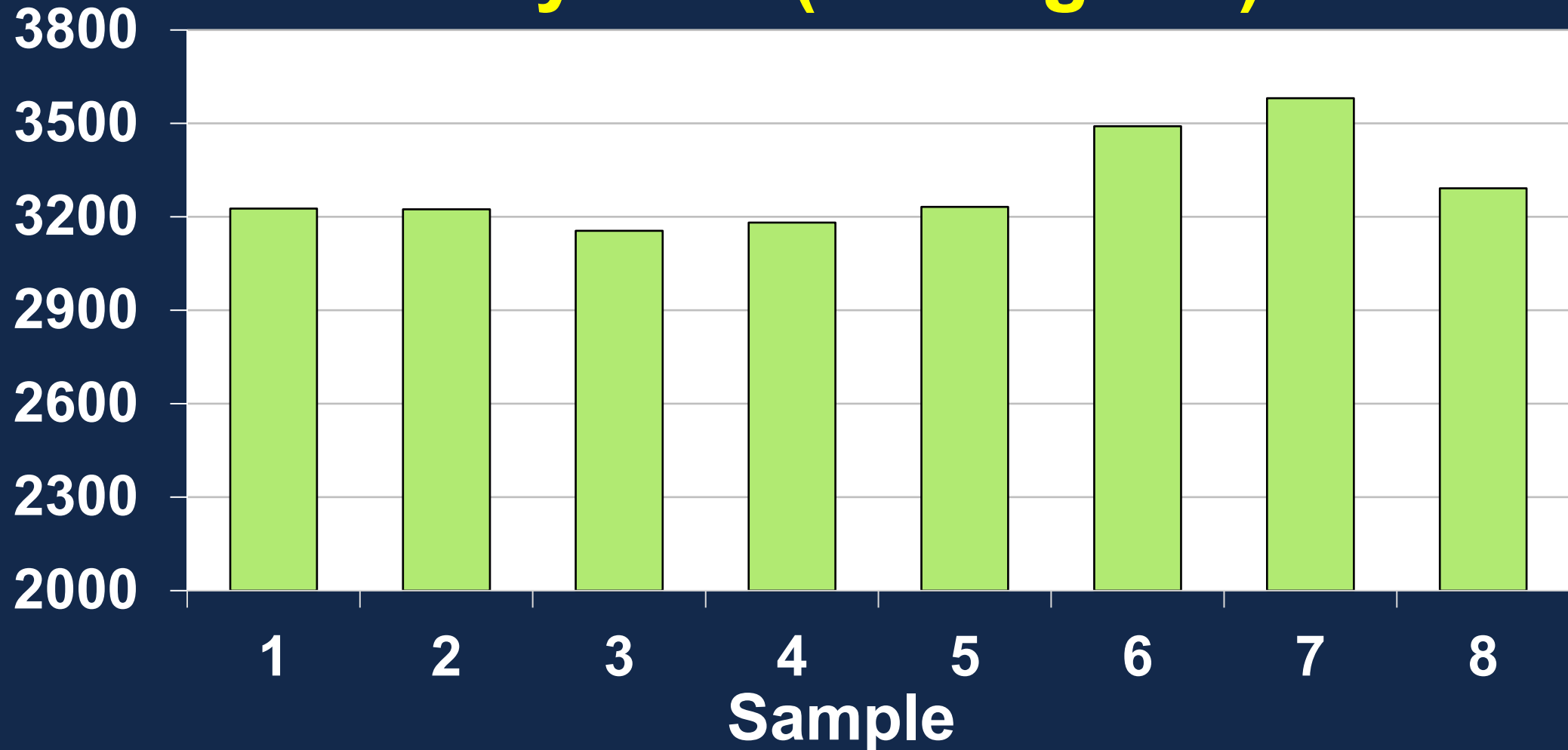
Parsons et al. (2023)

Overall AA Digestibility of Samples from 1 Fractionation System



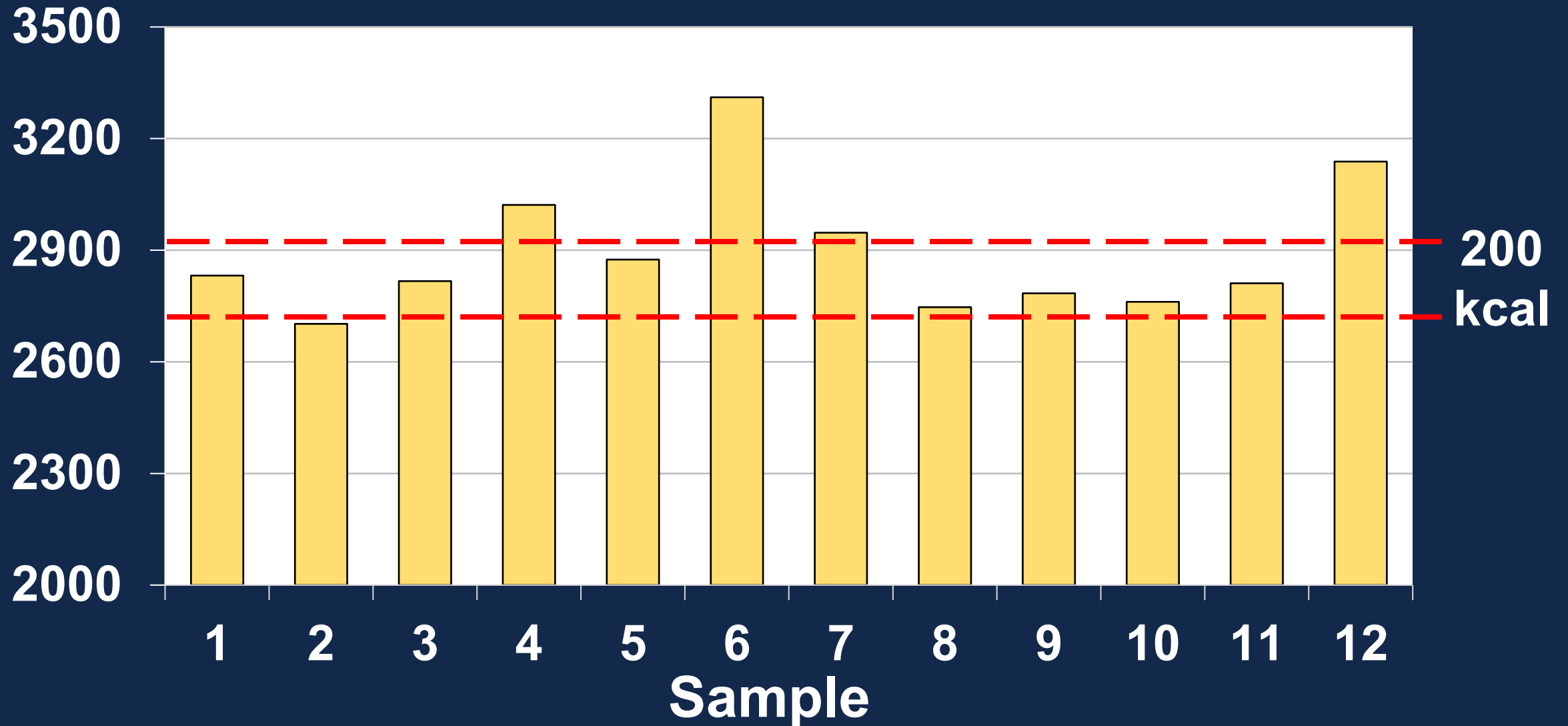
Parsons et al. (2023)

ME of Samples from 1 Fractionation System (kcal/kg DM)



Parsons et al. (2024)

ME in Conventional DDGS (kcal/kg DM)



Parsons et al. (2023;2024), VerBeek et al. (2024)

New Technologies/Updates:

4. Phytase

Phytase Use During Fermentation

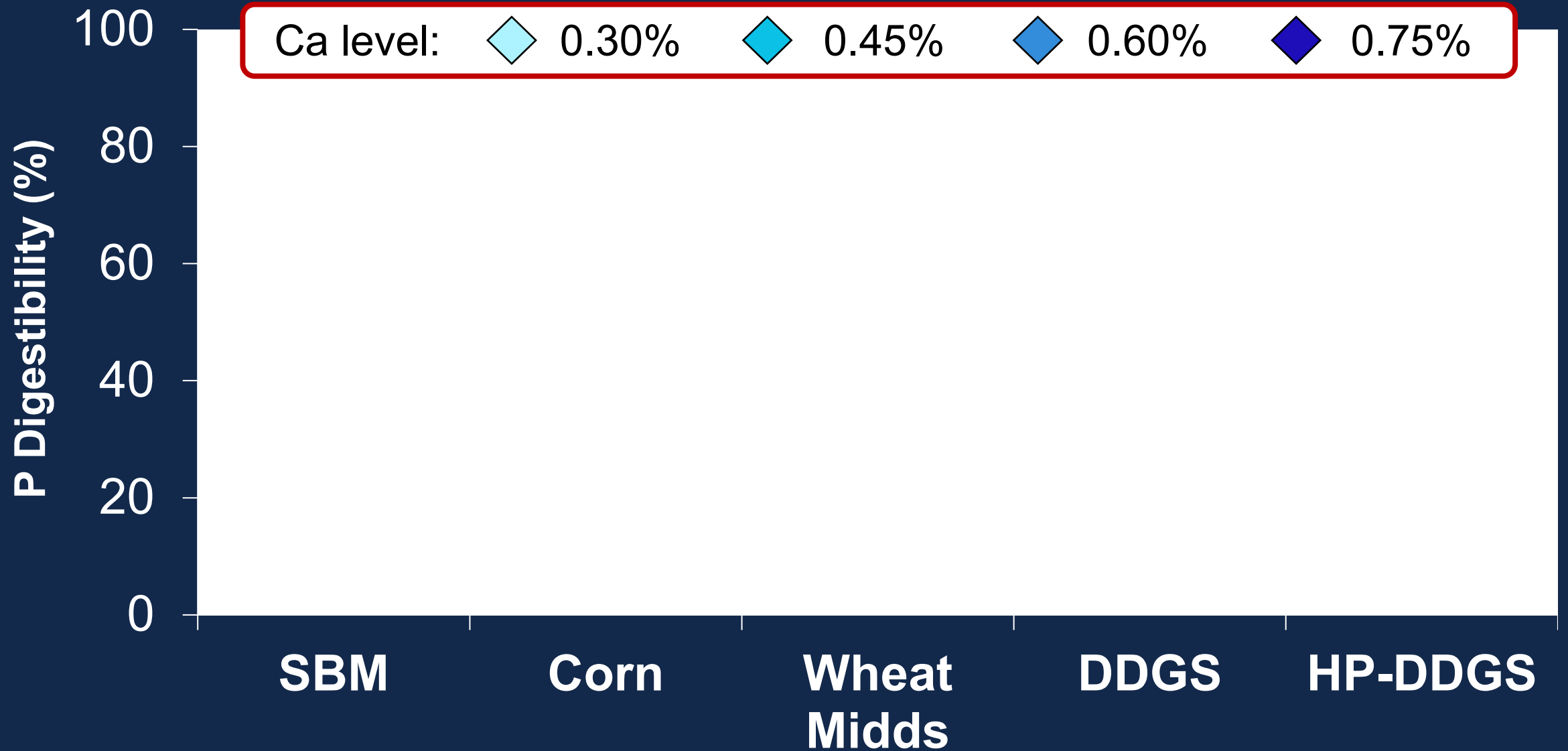
- Poultry have poor use of phytate-P
 - Improve P utilization by adding phytase
- Phytase use during fermentation **increases**
P availability in corn co-products

P Digestibility at Different Ca levels



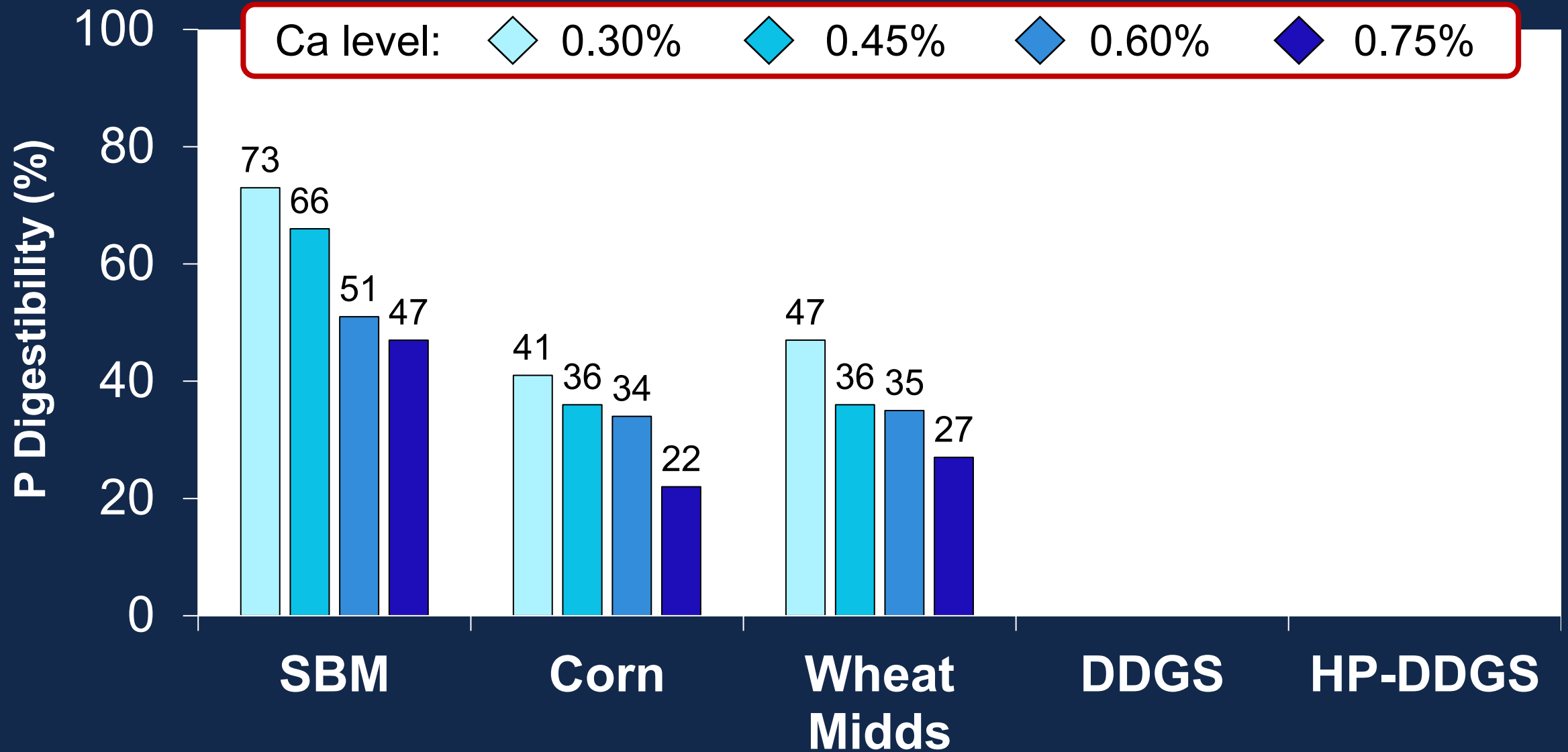
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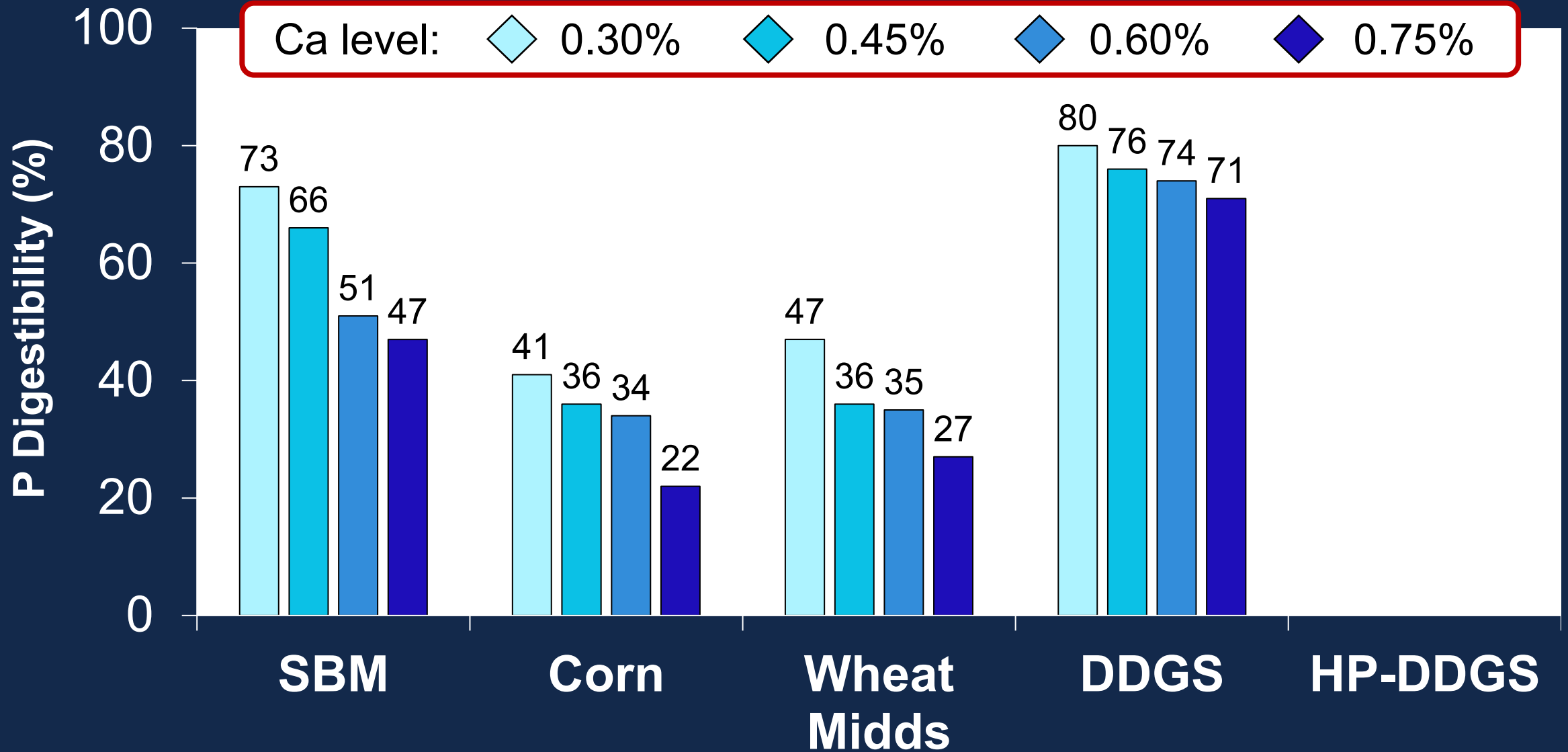
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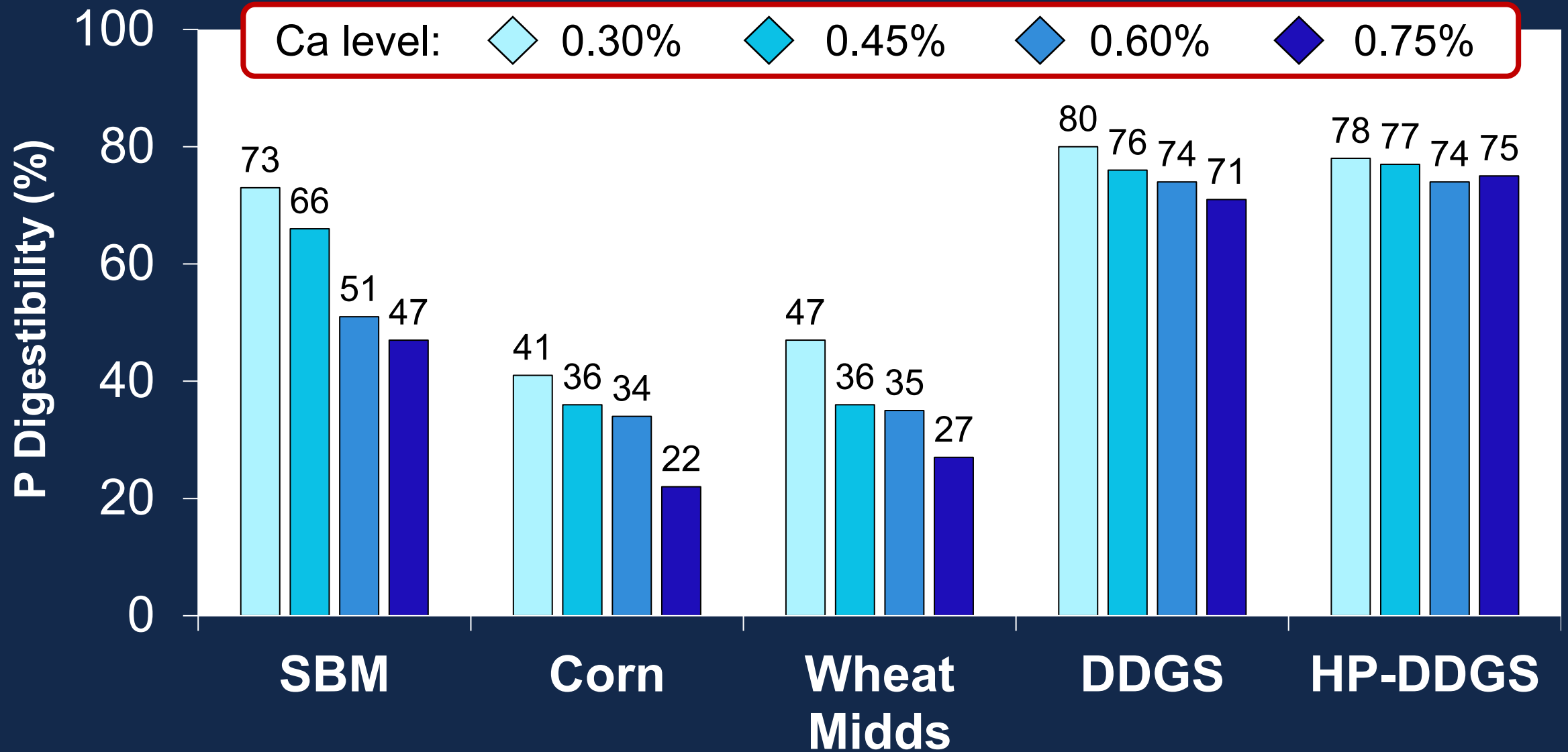
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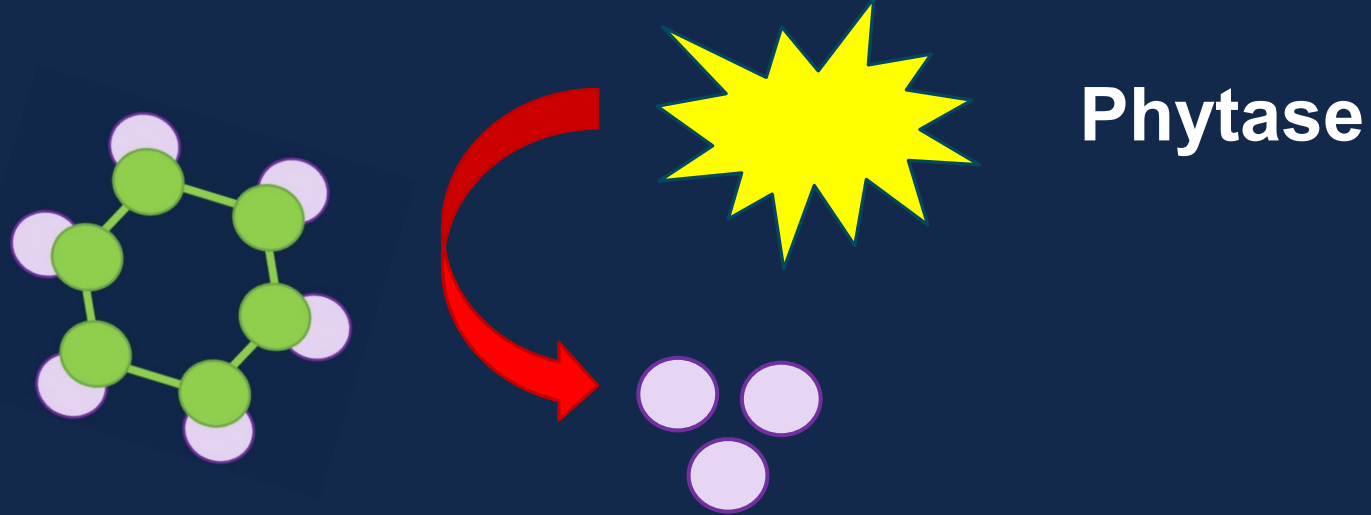
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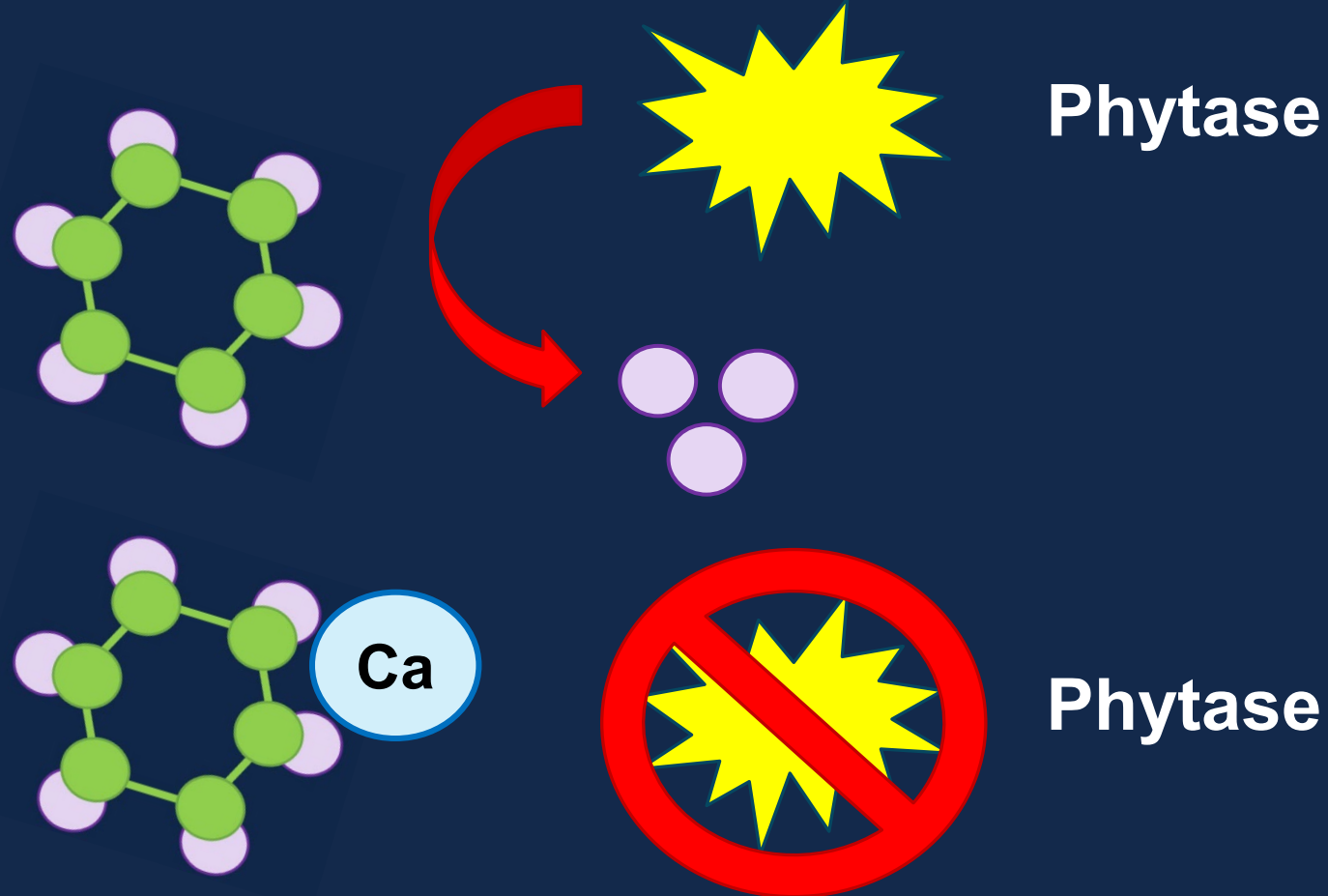
Calcium – Phytate Interaction

- Ca binds to phytate and prevents degradation by phytase

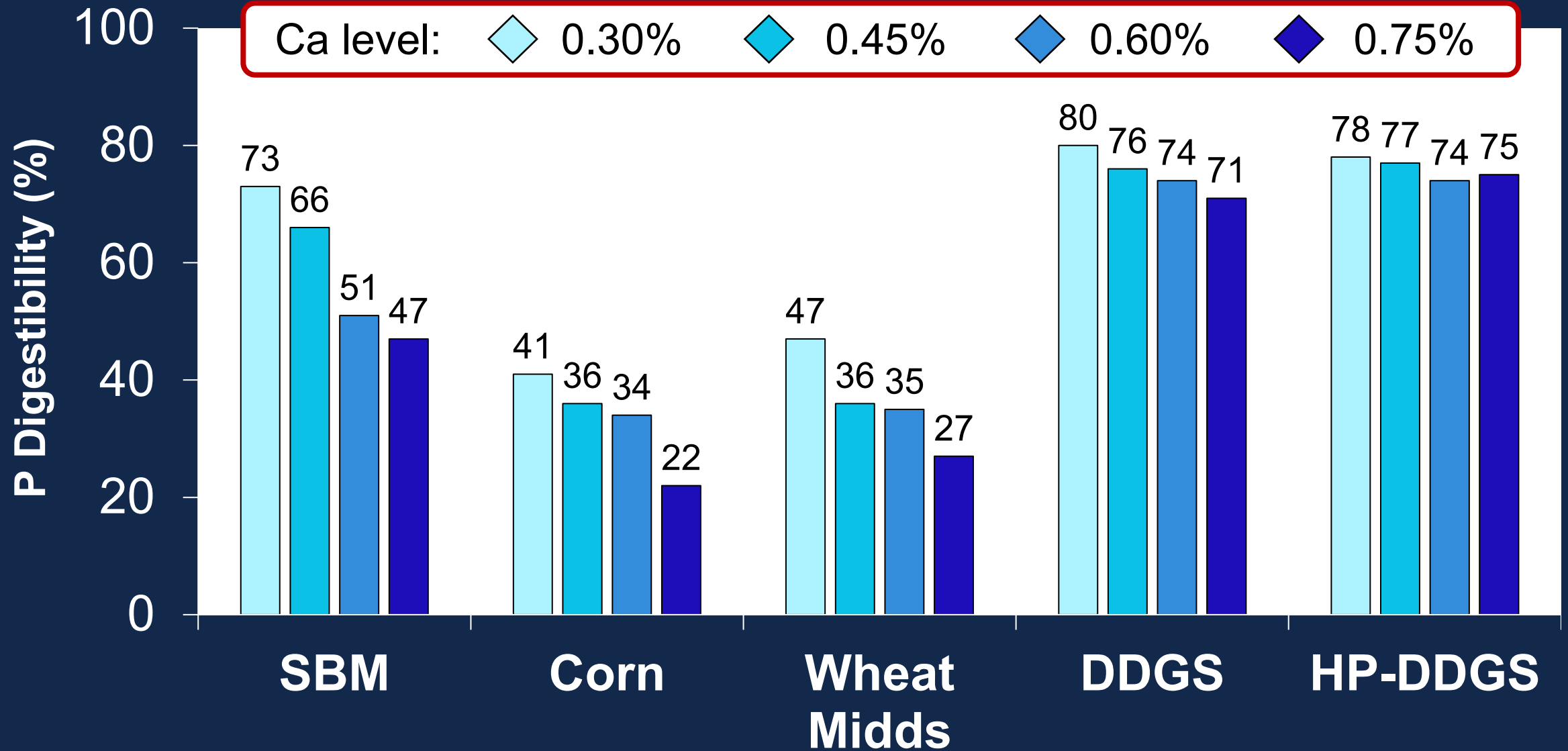


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P Digestibility at Different Ca levels



Parsons et al. (2024)

Summary / Key Points

- **1. ME content in DDGS is lower now than in the past**
 - **Crude fat level is a key driving factor**

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- **1. ME content in DDGS is lower now than in the past**
- **2. Fractionated products typically have increased ME**
 - **Higher protein**
 - **Lower fiber**
 - **Oil level in products should be considered**

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- 2. Fractionated products typically have increased ME
- 3. Lysine digestibility has increased in corn co-products
 - Milder drying processes
 - Reduced heat damage

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- 2. Fractionated products typically have increased ME
- 3. Lysine digestibility has increased in corn co-products
- 4. Consistency in corn co-products is improving
 - Conventional DDGS composition will change if fractionation is used

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- 2. Fractionated products typically have increased ME
- 3. Lysine digestibility has increased in corn co-products
- 4. Consistency in corn co-products is improving
- 5. Phytase use during fermentation increases P avail.
 - May have a greater effect on fractionated products?