KSU Swine Day 2013

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Special Events During KSU Swine Day

- 8:00 a.m. – 3:00 p.m. - Trade Show Open
- 11:00 a.m. - Porcine Epidemic Diarrhea Presentation by Dr. Henry and Dr. Hesse
- 11:00 a.m. – 2:00 p.m. - CHEW ON THIS presentation in the west parking lot
- 12:00 noon - Pork Lunch in Main Ballroom
- 1:15 p.m. – Recent Developments in Feed Mill Technology – Dr. Charles Stark
- 3:30 – 5:00 p.m. – Tour of the Feed Mill and K-State Ice Cream Reception

Simulation of Estrus and Ovulation in Lactating Sows

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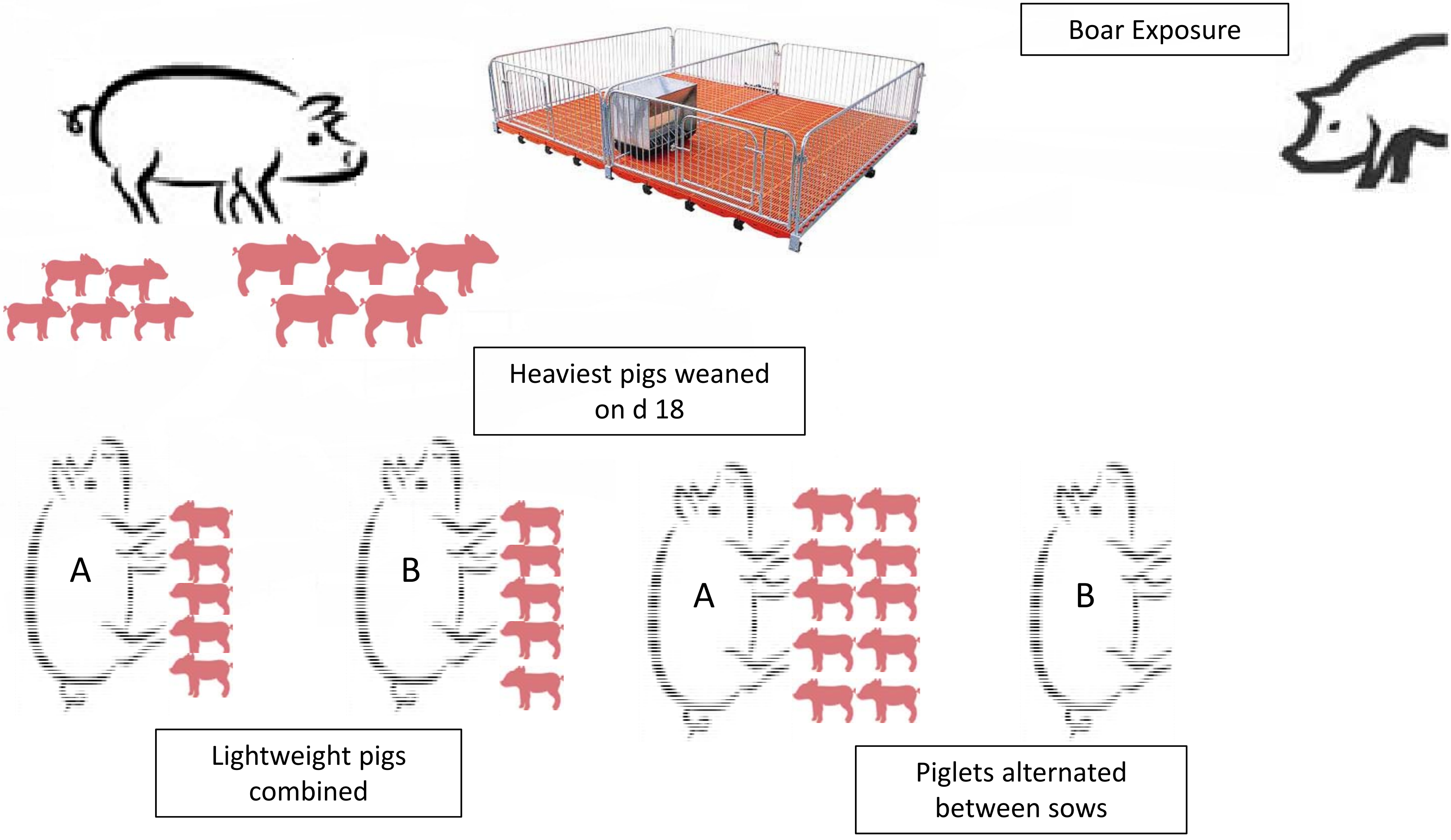
Background

- Continued pressure to transition away from gestation stalls necessitates investigation of alternative breeding management strategies.
- Breeding sows in lactation could reduce sow non-productive days while increasing lactation length to the benefit of the litter.
- Previous research indicates that reducing suckling pressure and boar exposure are critical stimuli.

Treatments

1) Traditional Lactation
2) Altered Suckling Treatment

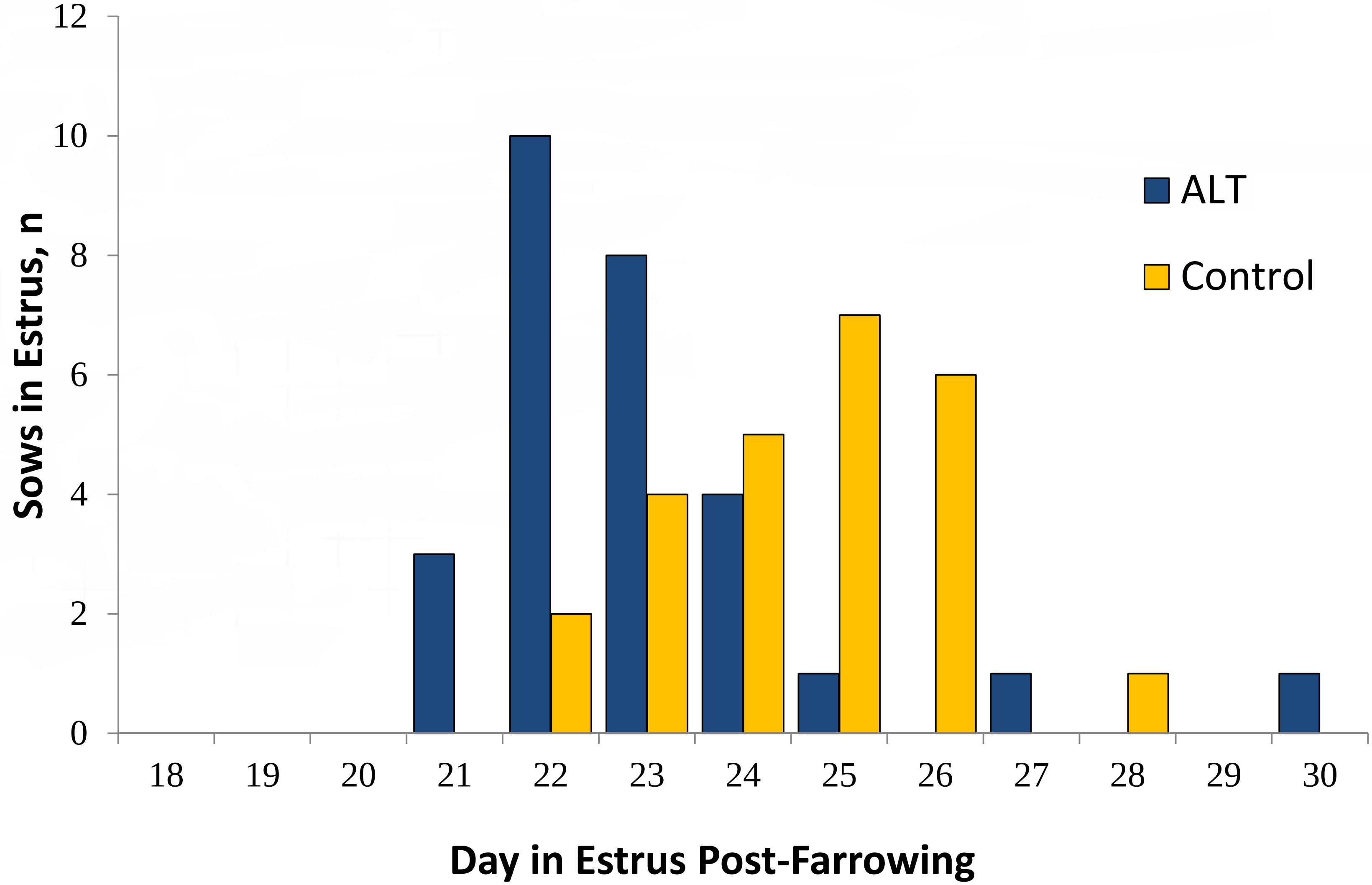
Altered Suckling Treatment



Sow Performance

Item	Control	ALT	SEM
Sows, n	25	28	----
Days in estrus post-farrowing	24.6[a]	23.0[b]	0.54
Inseminated in lactation, %	---	89.3%	---
Inseminated after weaning, %	96.0%	10.7%	---
Pregnancy rate, %	92.0%	89.0%	
Subsequent reproductive performance			
Number born alive	13.1	13.0	1.5
Litter weight, lb	39.0	39.7	4.1

[a, b] Means without a common superscript differ $P < 0.05$.



ALT
Control
Sows in Estrus, n
0
2
4
6
8
10
12
18
19
20
21
22
23
24
25
26
27
28
29
30
Day in Estrus Post-Farrowing

Piglet Performance

Item	Control	ALT	SEM
Pigs, n	289	322	---
Weaning age, d	21	18 / 25	
Gain d 18 to 32, lb	7.21	7.27	0.727
Litter standard deviation			
d 18	2.19	2.12	0.178
d 32	3.11	2.55	0.290
SD change, d 18 to 32	0.92[b]	0.43[a]	0.133

[a, b] Means without a common superscript differ $P < 0.05$.

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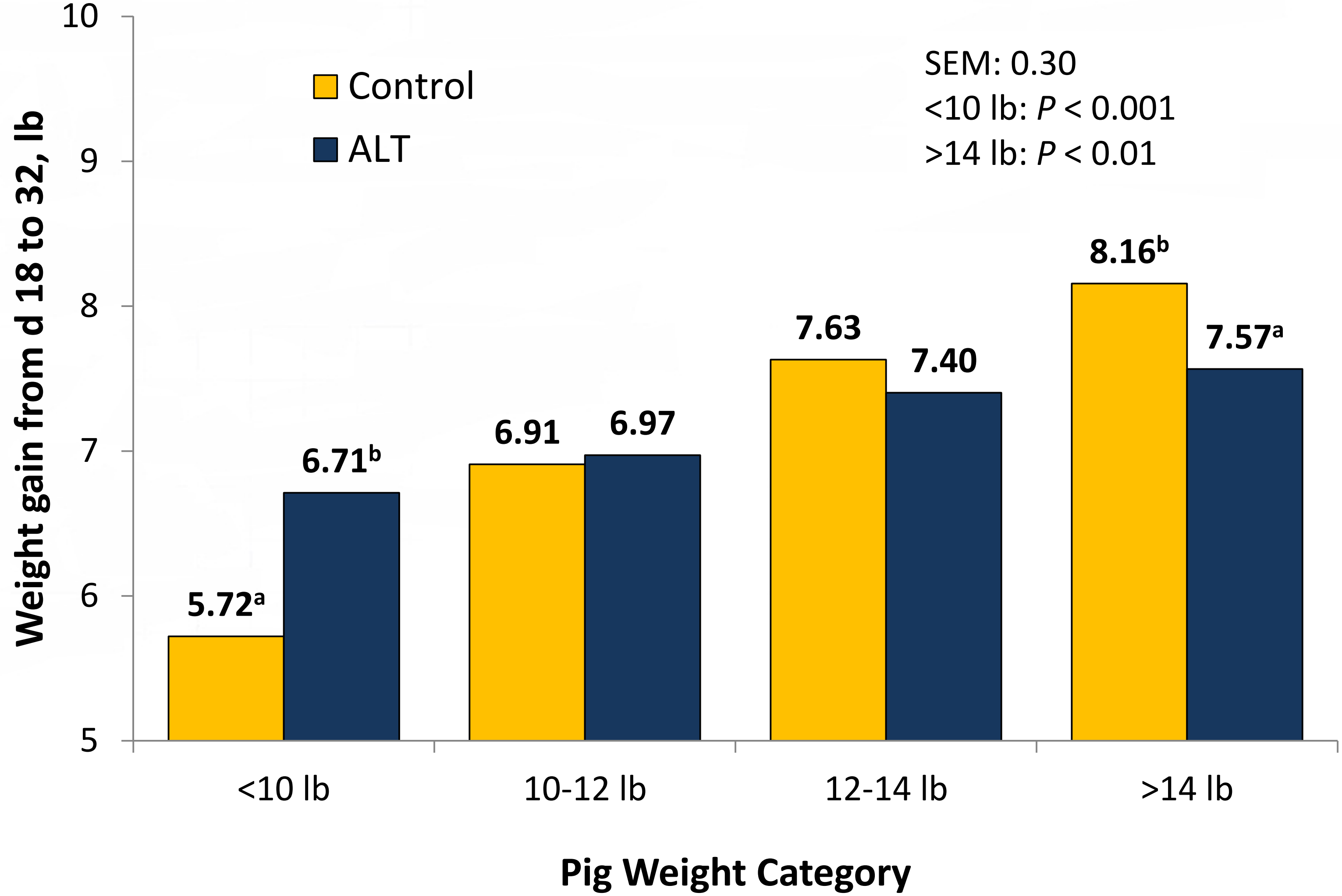

[a, b] Means without a common superscript differ $P < 0.05$.

Conclusions

- Lactational estrus can be stimulated at rates similar to conventional weaning.
- No detrimental effects were seen for farrowing rate or subsequent litter size.
- Litter growth was similar between treatments, but litter weight variation was reduced by over 50%. Future research should track weights to market.
- Additional research is needed to develop the most practical protocols and confirm results in a commercial setting.

OvuGel™

(triptorelin acetate)

100 mcg triptorelin per mL (as triptorelin acetate)

Gel for intravaginal use

INDICATIONS FOR USE:

For the synchronization of time of insemination in weaned sows to facilitate a single fixed-time artificial insemination.

Not approved for use in gilts. Safety and effectiveness have not been evaluated in these animals.

DESCRIPTION:

OvuGel™ is a thin, clear to slightly hazy gel. Each mL of OvuGel™ contains 100 mcg of triptorelin (as triptorelin acetate) for intravaginal administration.

OvuGel® is a GnRH agonist given to sows intravaginally, four days post-weaning. OvuGel® stimulates the release of LH, inducing ovulation 40-48 hours post-treatment. It facilitates single dose fixed-time insemination without estrus detection in weaned sows, resulting in normal fertility.

- OvuGel® is administered on the morning of day 4, approximately 96 hours post-weaning.
- A single insemination is performed early on day 5 post-weaning, approximately 24 hours post-treatment.
- No estrus detection is required to determine insemination time.
- The OvuGel® program potentially allows producers to utilize labor more efficiently.
- Pigs per semen dose are increased, leveraging high value genetics.

OvuGel®
Breeding Eligible Sows
AI
nursing litter
wean
am pm am pm am pm am pm am pm am pm am pm am pm
day 0
day 1
day 2
day 3
day 4
day 5
day 6
day 7
day 8

Effectiveness Trials Comparing Untreated Control Sows with OvuGel™-Treated Sows

	Control	OvuGel™
Service Eligible Sows	1092	490
No. Inseminated by 7 d post-weaning	947	490
Doses of Semen per Sow Inseminated	2.1	1.0
No. Sows Farrowed	838	396
Farrow Rate for Service Eligible Sows	76.7	80.8
Born Alive per Litter	11.2	11.2
Total Born per Semen Dose	5.3	9.9
Piglet Index (Pigs born live/100 eligible sows)	861	908

[1]Numbers in table are unadjusted means and raw numbers of studies performed at 5 US Locations. PTK 9-06 (Trials D-H).

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Effect of Timed Insemination Following OvuGel™ Treatment on Fertility[1]

	Control	OvuGel™
Service Eligible Sows	105	100
% Detected in Estrus	94.3	92.0
No. Inseminated by 7 d post-weaning	99	100
Doses of Semen per Sow Inseminated	2.2	1.0
No. Sows Farrowed	94	92
Farrow Rate for Service Eligible Sows	89.5	92.0
Born Alive per Litter	12.2	12.3
Total Born per Semen Dose	5.9	12.4
Piglet Index (Pigs born live/100 eligible sows)	1094	1130

[1] 2,500 sow farm (Trial C). Numbers in the table are unadjusted means and raw numbers. PTK 1-10-02.

Effect of Timed Insemination Following OvuGel™ Treatment on Fertility[1]

	Control	OvuGel™
Service Eligible Sows	148	149
% Detected in Estrus	82	84
No. Inseminated by 7 d post-weaning	121	149
Doses of Semen per Sow Inseminated	2.2	1.0
No. Sows Farrowed	109	115
Farrow Rate for Service Eligible Sows	73.6	77.2
Born Alive per Litter	10.9	11.3
Total Born per Semen Dose	4.9	9.7
Piglet Index (Pigs born live/100 eligible sows)	805	872

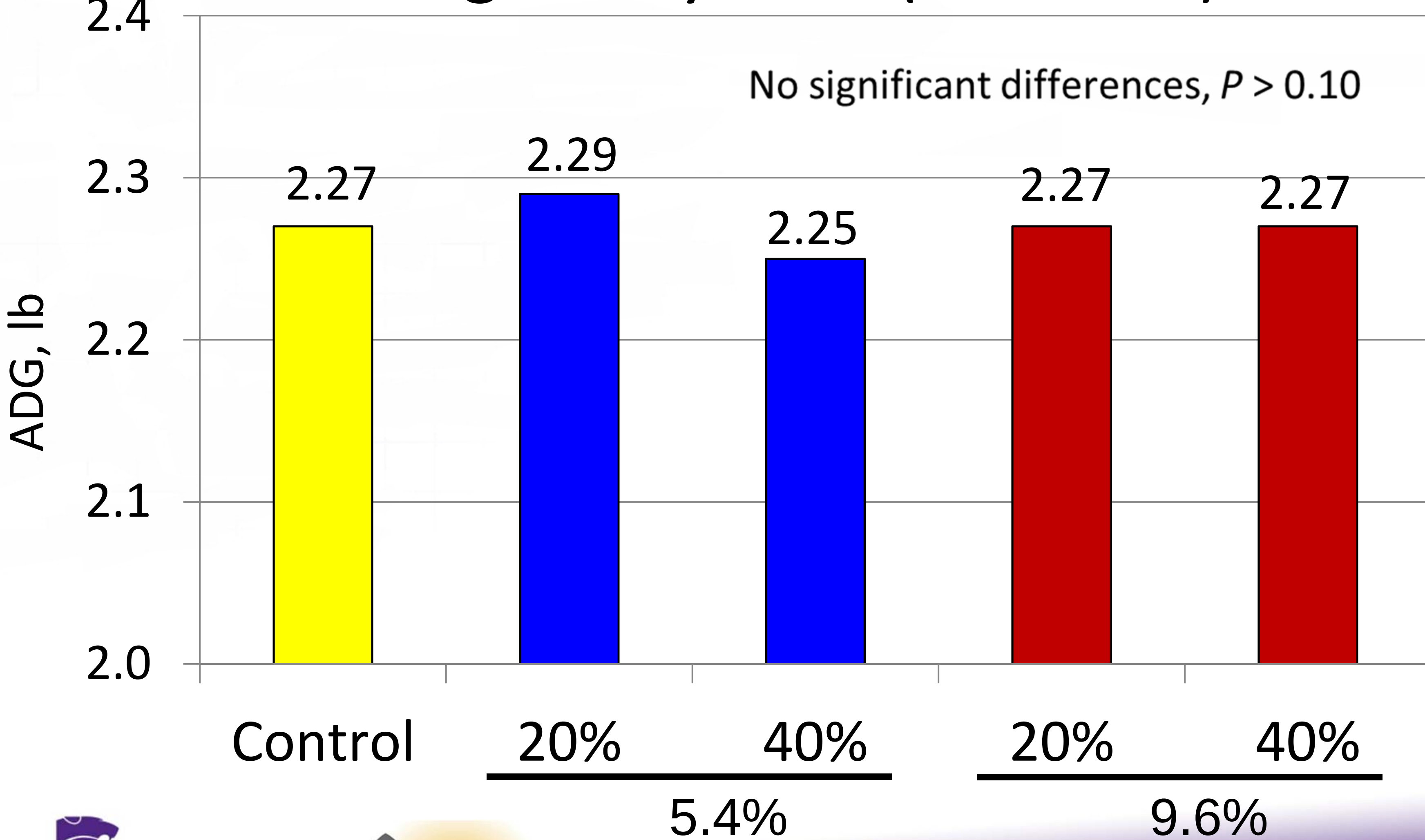
[1] 14,000 sow farm (Trial B). Numbers in the table are unadjusted means and raw numbers. PTK 4-07

HAPPY THANKSGIVING

DDGS Update

1) Economics of medium- and low-oil DDGS
2) DDGS/fiber withdrawal in late finishing

Effects of DDGS Source and Level on Average Daily Gain (d 0 to 82)



Graham et al., 2013

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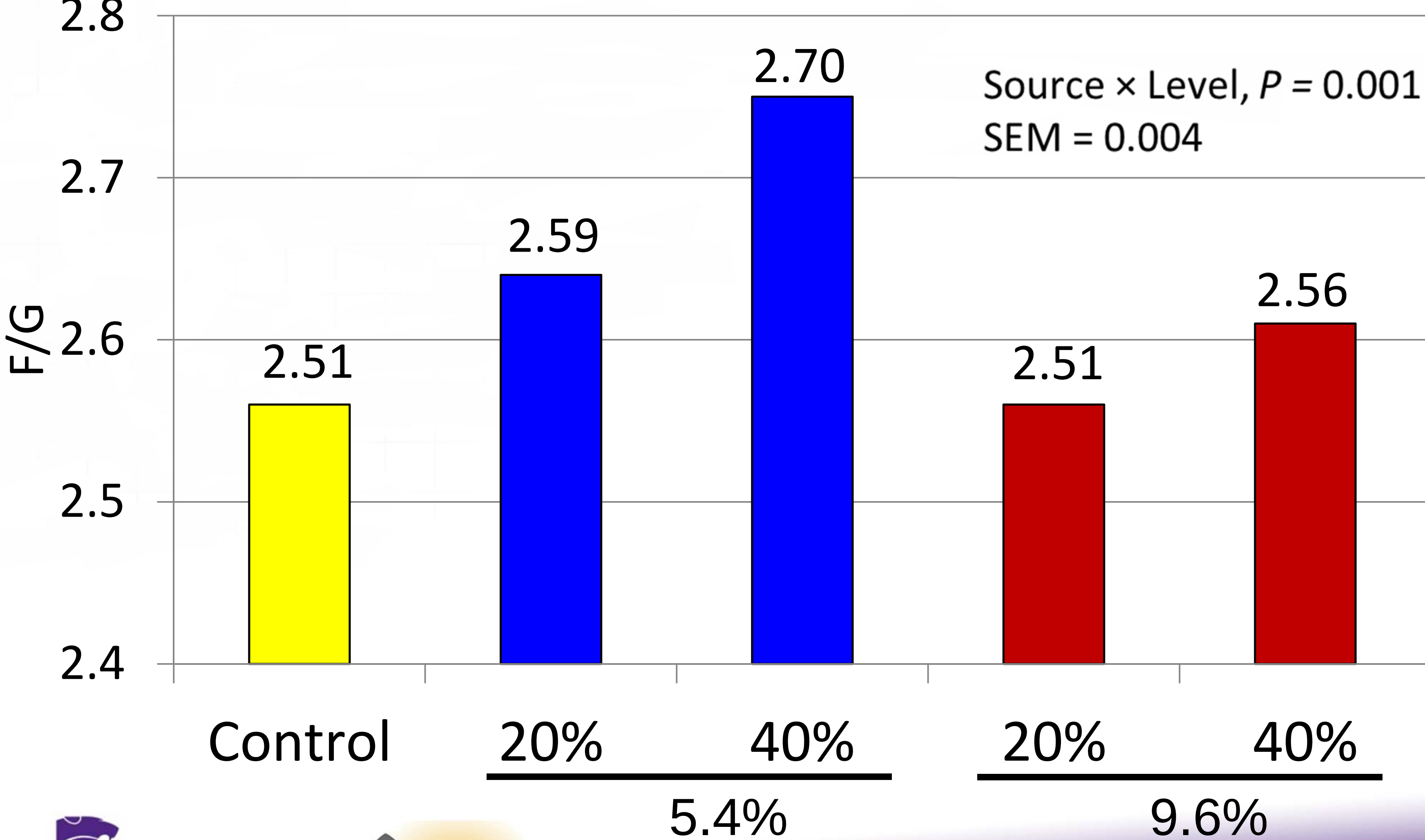
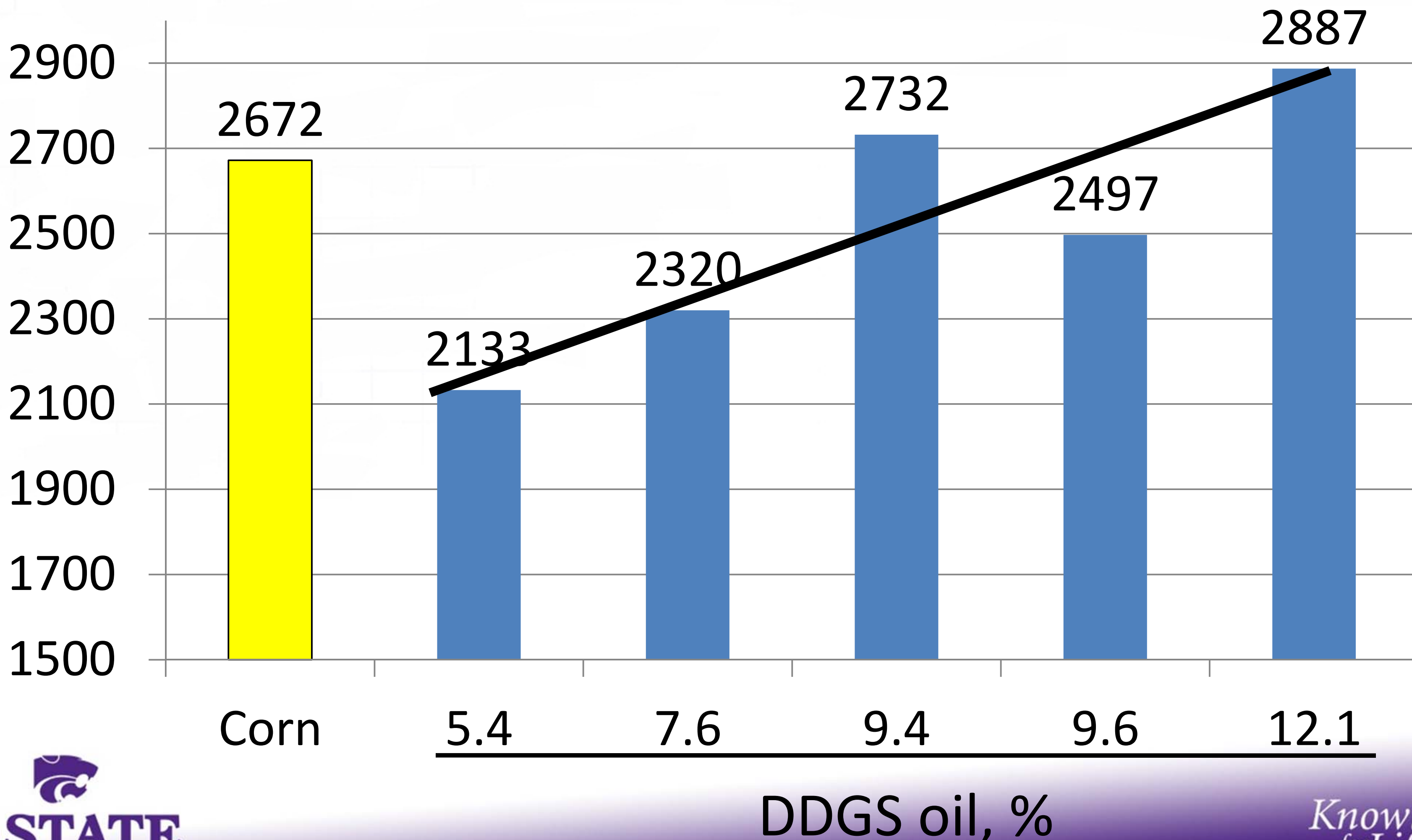
Effects of DDGS Source and Level on Feed Efficiency (d 0 to 82)



Graham et al., 2013

NE values, kcal/kg (as-fed)



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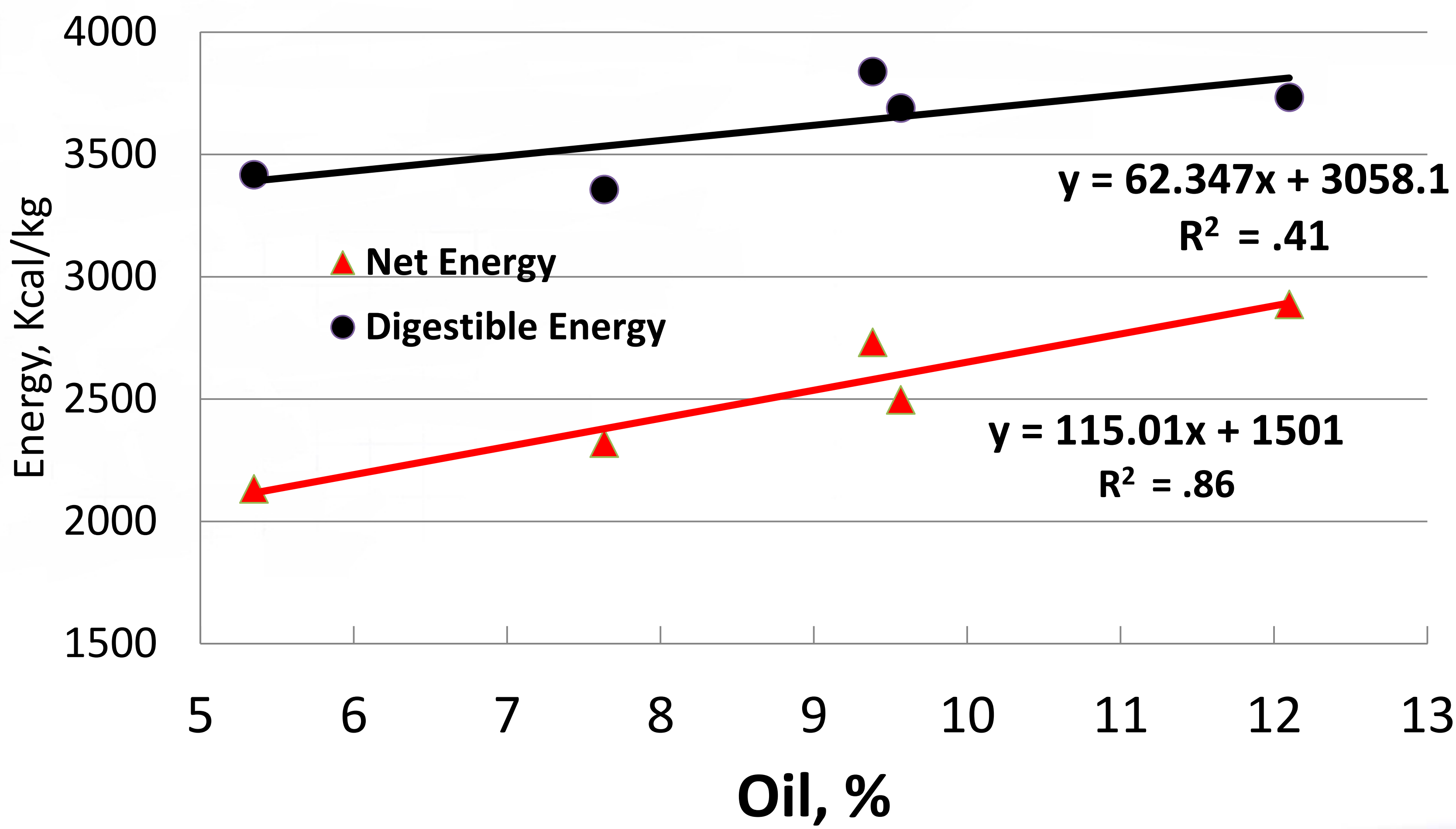
DE and NE prediction equations

- Stepwise regression was then used to establish DE and NE prediction equations.
- Variables included in the regression analysis were the linear and quadratic terms of oil (ether extract), CP, CF, ADF, NDF, particle size, and bulk density.
- Only oil (ether extract) content was found to be significant in the model.

Predicted Digestible and Net Energy of DDGS



K-State DDGS Calculator (Variable DDGS Energy)

Calculator attempts to consider economic return per pig from change in diet cost, feed efficiency, and growth rate. It does not account for any economic impact on yield or iodine value.

Corn, $/bu	$ 4.25	$ 151.79
SBM, $/ton	$ 425.00	
Monocal, $/ton	$ 600.00	
Limestone, $/ton	$ 36.20	
Lysine HCl, $/lb	$ 0.80	
DL-Met, $/lb	$ 1.90	
L-Threonine, $/lb	$ 1.25	
DDGS, $/ton	$ 200.00	

132% =DDGS to Corn price ratio

Use fat to equalize energy	No
Include L-Trp in diets?	No
Energy as % of corn or oil content	Oil, %
DDGS oil content, %	8.0%
Value of pig gain, $/lb	$ 0.70
Fat, $/lb	$ 0.40
L-Trp, $/lb	$ 9.00

Start weight, lb	**50**	**75**	**125**	**170**	**210**	**246**	
End weight, lb	**75**	**125**	**170**	**210**	**246**	**280**	
DDGS maximum value	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**Total**
DDGS % at max savings	**25**	**15**	**15**	**5**	**5**	**10**	
Max savings, $/pig	**$0.08**	**$0.10**	**$0.03**	**$0.02**	**$0.01**	**$0.04**	**$0.29**
DDGS levels chosen	**20%**	**20%**	**20%**	**20%**	**10%**	**10%**	
- Savings, $/pig	**$0.06**	**$0.09**	**$0.00**	**-$0.03**	**$0.01**	**$0.04**	**$0.17**

Available online at www.KSUswine.org

K-State DDGS Calculator (Variable DDGS Energy)

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Monocal, $/ton	$ 600.00	
Limestone, $/ton	$ 36.20	
Lysine HCl, $/lb	$ 0.80	
DL-Met, $/lb	$ 1.90	
L-Threonine, $/lb	$ 1.25	
DDGS, $/ton	$ 220.00	

145% =DDGS to Corn price ratio

Use fat to equalize energy	No
Include L-Trp in diets?	No
Energy as % of corn or oil content	Oil, %
DDGS oil content, %	8.0%
Value of pig gain, $/lb	$ 0.70
Fat, $/lb	$ 0.40
L-Trp, $/lb	$ 9.00

Start weight, lb	**50**	**75**	**125**	**170**	**210**	**246**	
End weight, lb	**75**	**125**	**170**	**210**	**246**	**280**	
DDGS maximum value	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**Total**
DDGS % at max savings	**0**	**0**	**0**	**0**	**0**	**0**	
Max savings, $/pig	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
DDGS levels chosen	**20%**	**20%**	**20%**	**20%**	**10%**	**10%**	
- Savings, $/pig	**-$0.04**	**-$0.14**	**-$0.25**	**-$0.28**	**-$0.11**	**-$0.08**	**-$0.90**

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K-State DDGS Calculator (Variable DDGS Energy)

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SBM, $/ton	$ 425.00	
Monocal, $/ton	$ 600.00	
Limestone, $/ton	$ 36.20	
Lysine HCl, $/lb	$ 0.80	
DL-Met, $/lb	$ 1.90	
L-Threonine, $/lb	$ 1.25	
DDGS, $/ton	$ 200.00	

132% =DDGS to Corn price ratio

Use fat to equalize energy	No
Include L-Trp in diets?	No
Energy as % of corn or oil content	Oil, %
DDGS oil content, %	7.5%
Value of pig gain, $/lb	$ 0.70
Fat, $/lb	$ 0.40
L-Trp, $/lb	$ 9.00

Start weight, lb	**50**	**75**	**125**	**170**	**210**	**246**	
End weight, lb	**75**	**125**	**170**	**210**	**246**	**280**	
DDGS maximum value	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**Total**
DDGS % at max savings	**25**	**15**	**0**	**0**	**0**	**5**	
Max savings, $/pig	**$0.02**	**$0.03**	**$0.00**	**$0.00**	**$0.00**	**$0.01**	**$0.06**
DDGS levels chosen	**20%**	**20%**	**20%**	**20%**	**10%**	**10%**	
- Savings, $/pig	**$0.01**	**-$0.01**	**-$0.09**	**-$0.11**	**-$0.03**	**$0.01**	**-$0.22**

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K-State DDGS Calculator (Variable DDGS Energy)

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DDGS, $/ton	$ 200.00	

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Use fat to equalize energy	No
Include L-Trp in diets?	Yes
Energy as % of corn or oil content	Oil, %
DDGS oil content, %	8.0%
Value of pig gain, $/lb	$ 0.70
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L-Trp, $/lb	$ 9.00

Start weight, lb	**50**	**75**	**125**	**170**	**210**	**246**	
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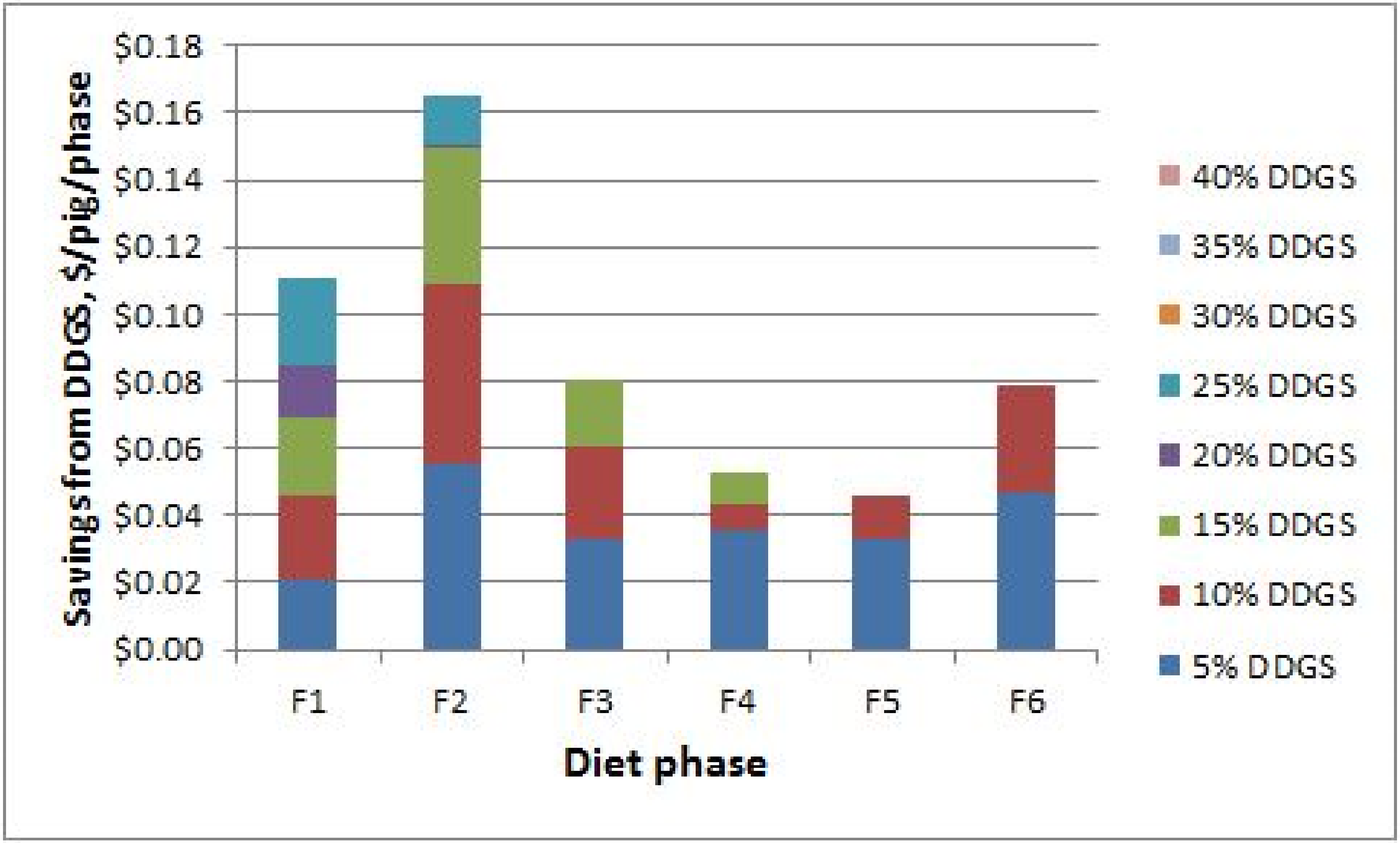
DDGS maximum value	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**Total**
DDGS % at max savings	**40**	**40**	**35**	**30**	**25**	**20**	
Max savings, $/pig	**$0.40**	**$0.88**	**$0.74**	**$0.65**	**$0.51**	**$0.39**	**$3.58**
DDGS levels chosen	**20%**	**20%**	**20%**	**20%**	**10%**	**10%**	
- Savings, $/pig	**$0.22**	**$0.45**	**$0.49**	**$0.45**	**$0.24**	**$0.22**	**$2.05**

Available online at www.KSUswine.org



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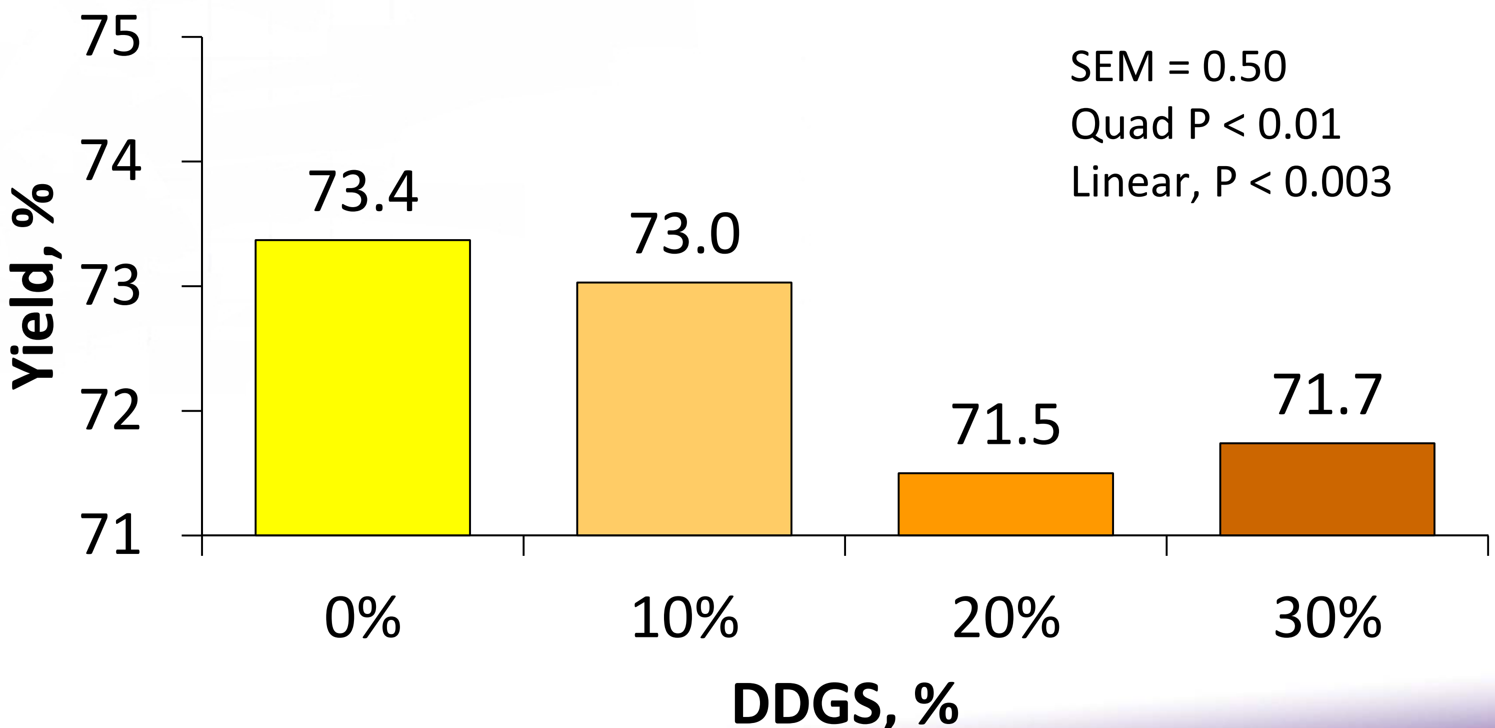
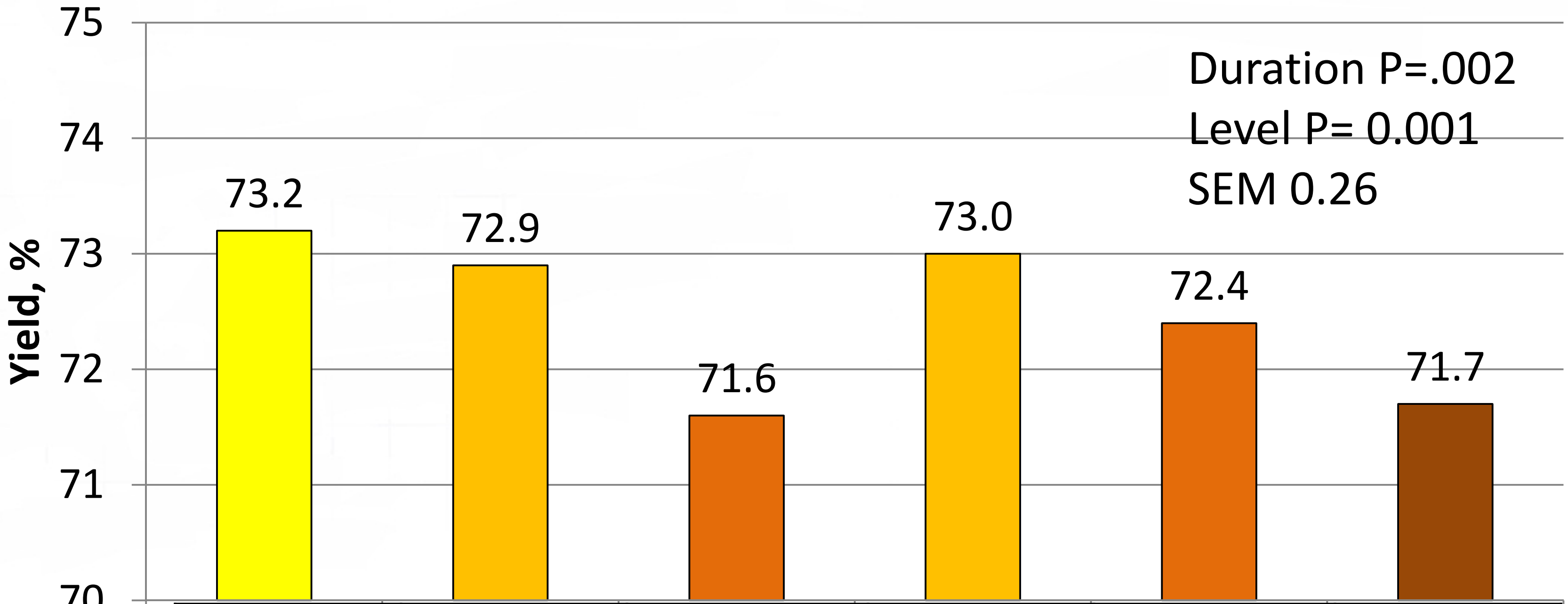
Feeding of high fiber diets before market

- Feeding diets containing DDGS reduce feed cost in many situations, but also reduce carcass yield



Whitney et al., 2006

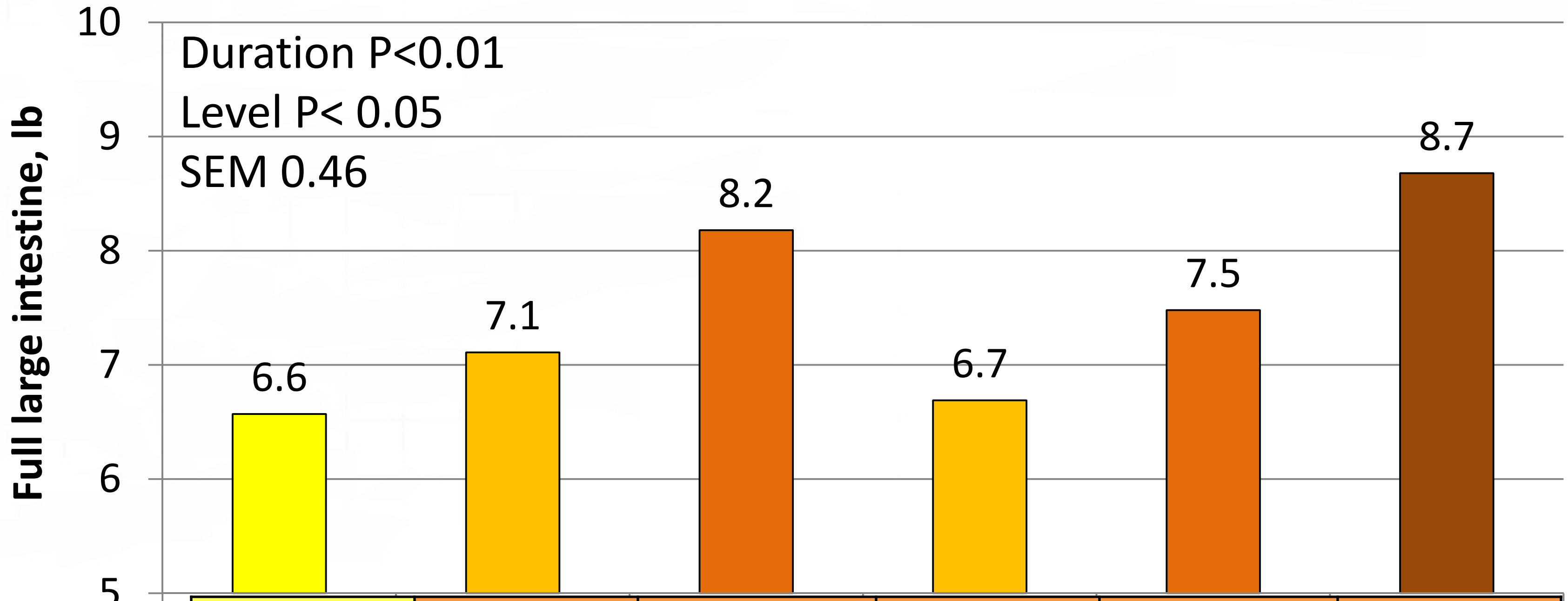
Effect of DDGS (0, 15, 30%) and Midds (0, 9.5, 19%) on pig performance (90 to 270 lb)



d 0 to 43:	Low	High	High	High	High	High
d 43 to 67:	Low	Low	Med	High	High	High
d 67 to 90:	Low	Low	Med	Low	Med	High

Asmus et al., 2011

Effect of DDGS (0, 15, 30%) and Midds (0, 9.5, 19%) on pig performance (90 to 270 lb)



d 0 to 43:	Low	High	High	High	High	High
d 43 to 67:	Low	Low	Med	High	High	High
d 67 to 90:	Low	Low	Med	Low	Med	High

Asmus et al., 2011

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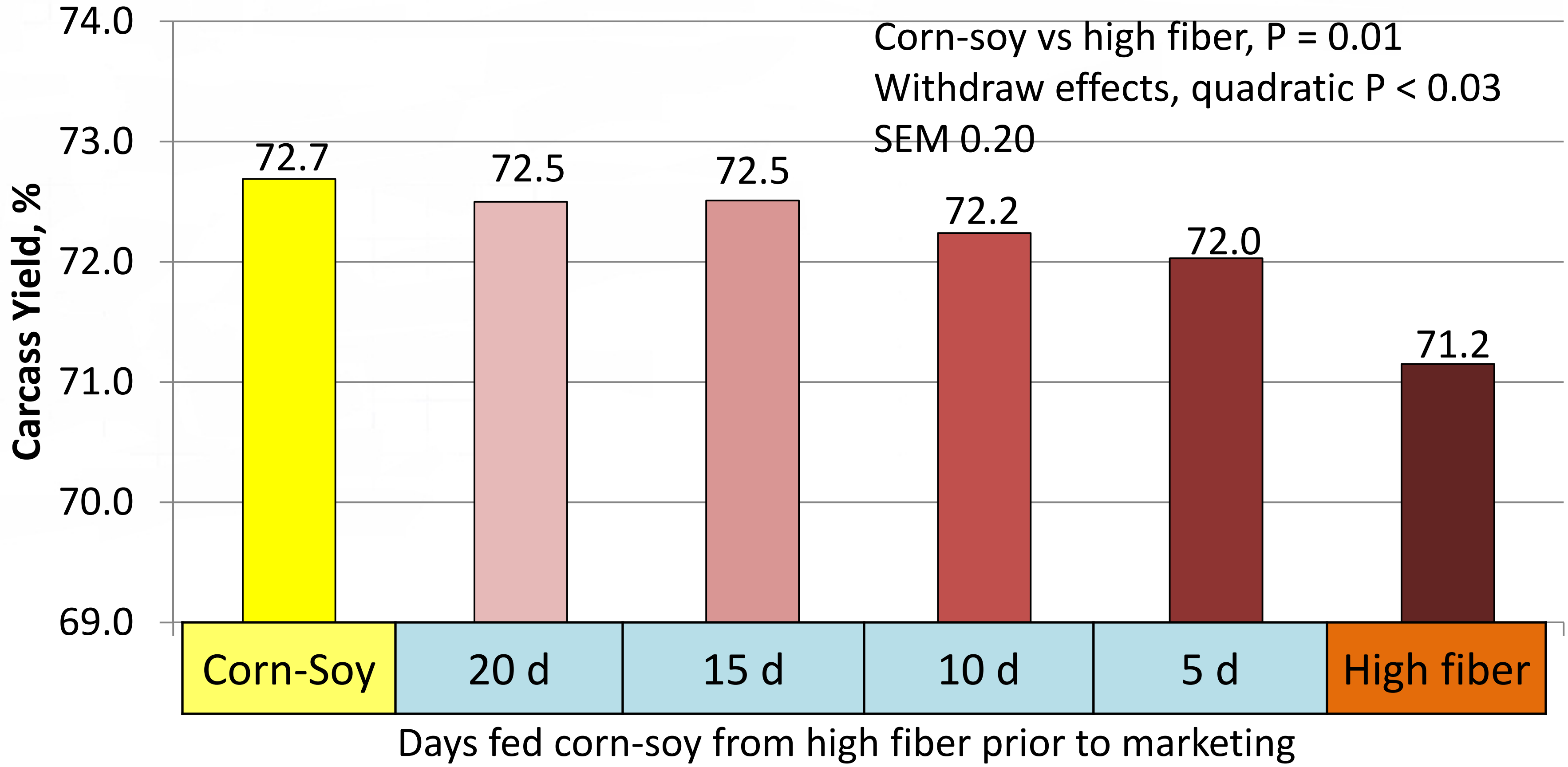
Effect of DDGS (30%) and Midds (19%) at varied withdraw times prior to slaughter

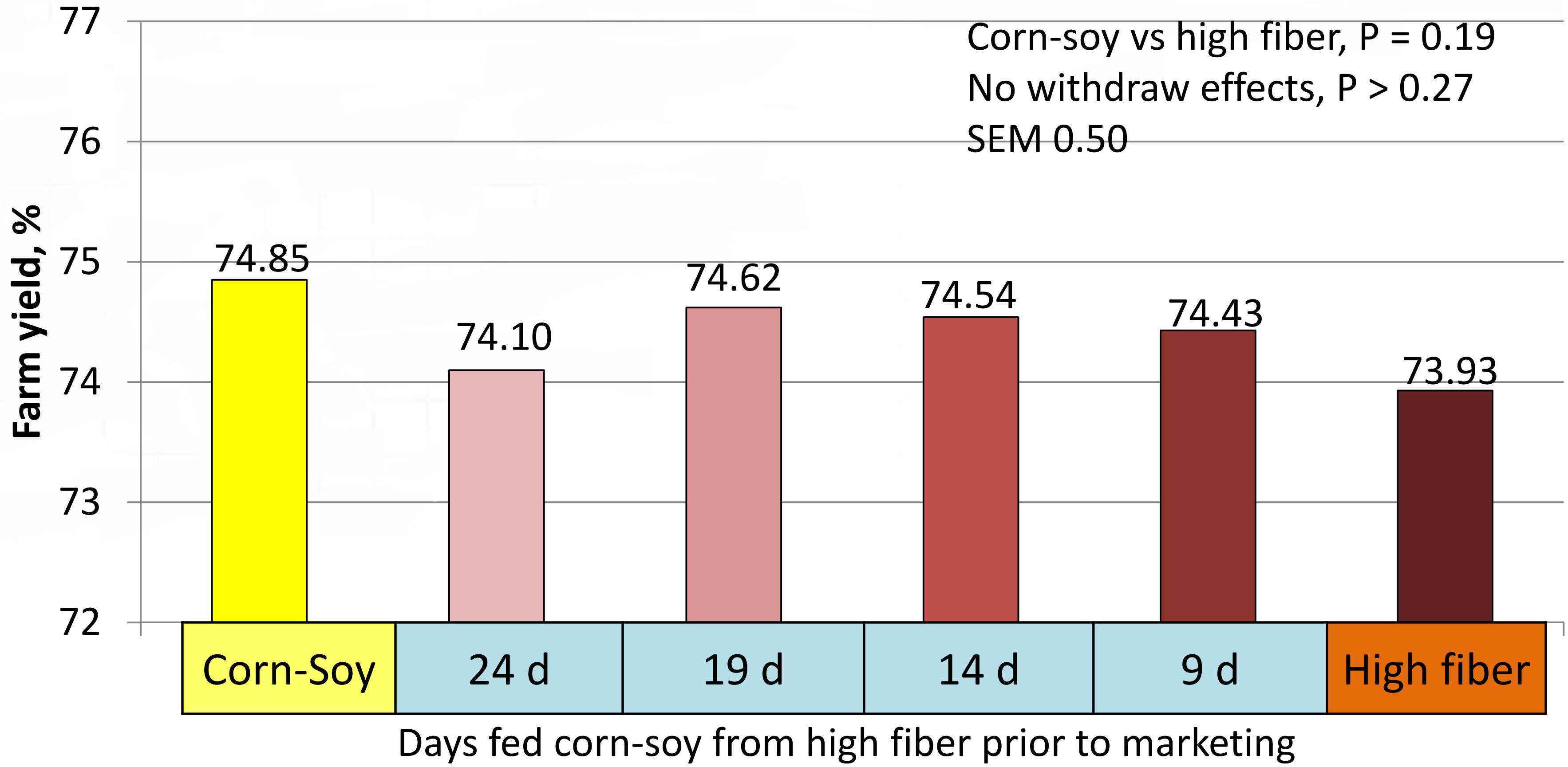
Exp. 1



Coble et al., 2013

Effect of DDGS (30%) and Midds (19%) at varied withdraw times prior to slaughter

Exp. 2



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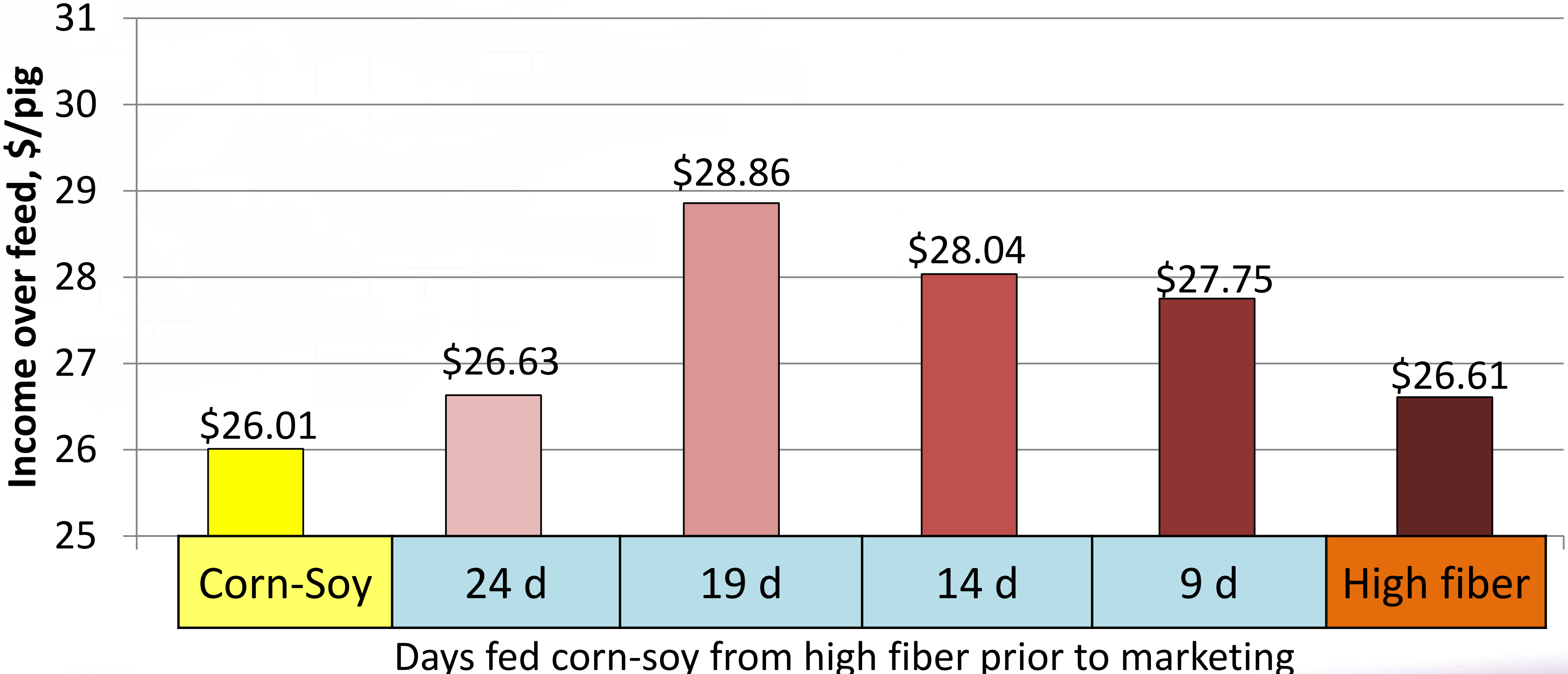
Coble et al., 2013

Knowledge for Life

Effect of DDGS (30%) and Midds (19%) at varied withdraw times prior to slaughter

Exp. 2 (at time of study)

	Corn-Soy	24 d	19 d	14 d	9 d	High fiber
Value, $	111.53	105.91	107.22	106.68	105.45	104.22
Feed, $	85.52	79.28	78.36	78.65	77.70	77.61



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Coble et al., 2013

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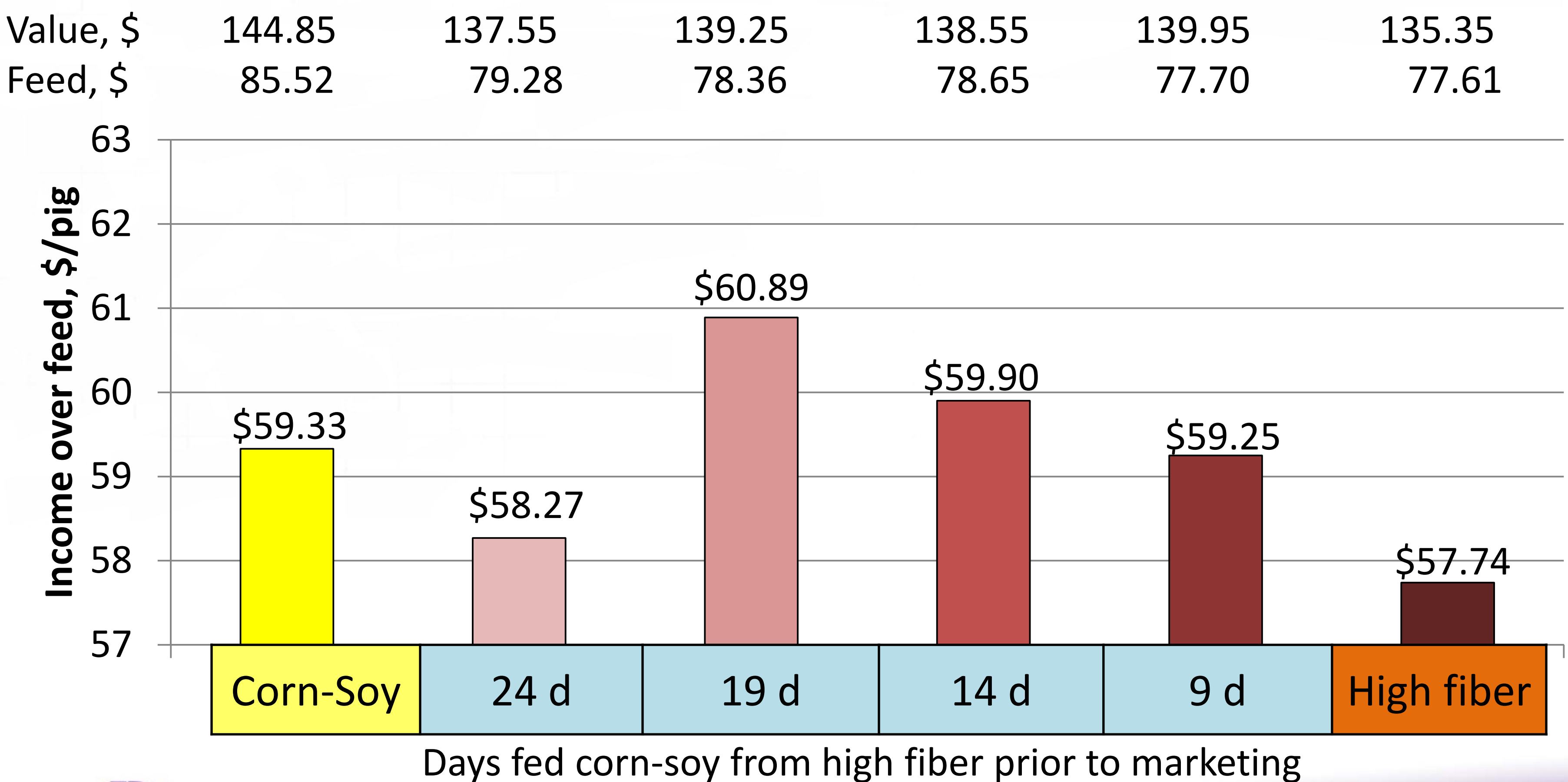
Effect of DDGS (30%) and Midds (19%) at varied withdraw times prior to slaughter

Exp. 2 (June 20, 2013 prices)



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Coble et al., 2013

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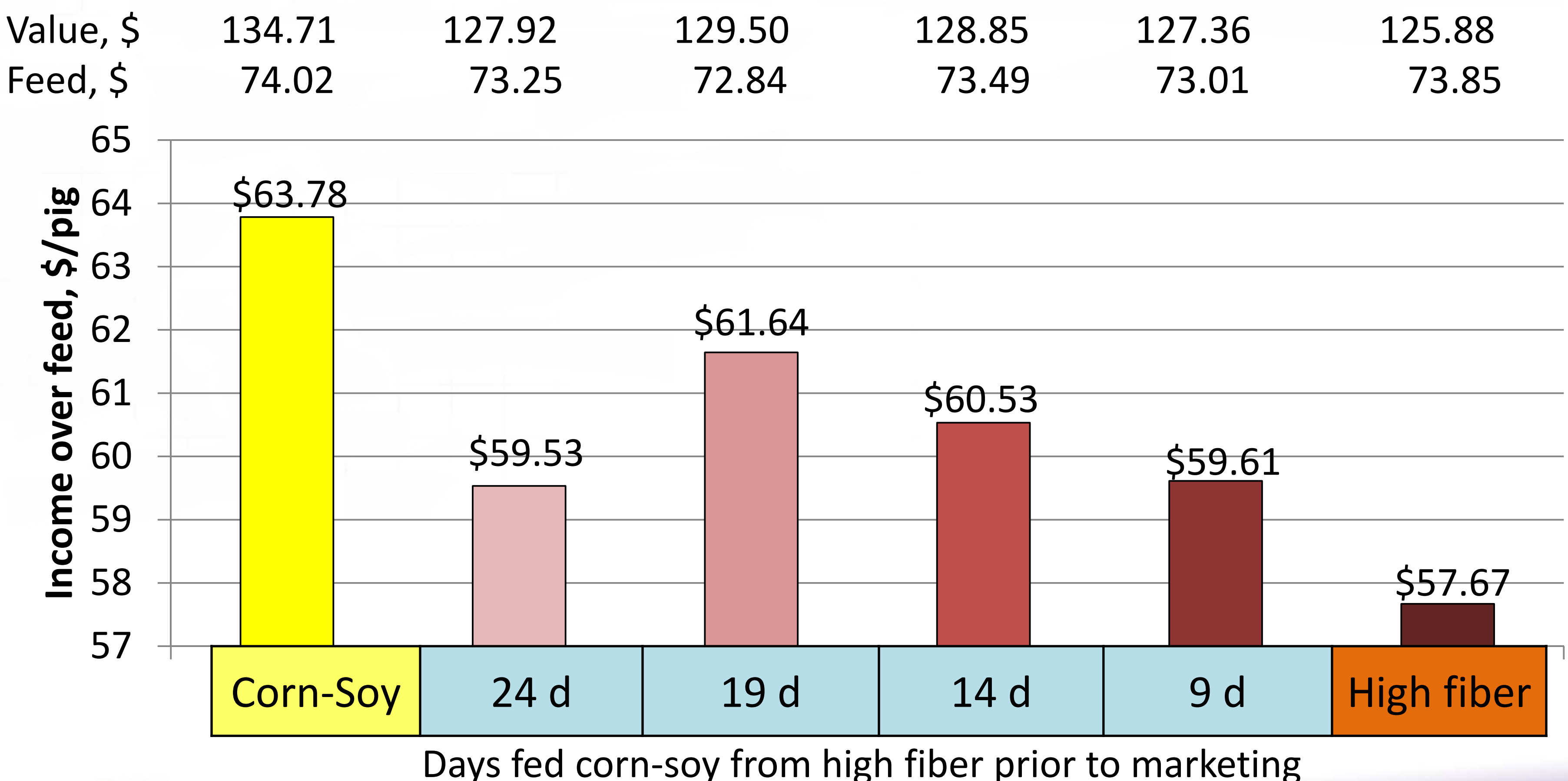
Effect of DDGS (30%) and Midds (19%) at varied withdraw times prior to slaughter

Exp. 2 (September, 2013 prices)



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Coble et al., 2013

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Removing pigs from high fiber diets

- Reduction in yield
  - Short term = < 5 days
    - Ex. high oil DDGS
- Reduction in carcass weight due to lower ADG?
  - Carcass weight appears to increase linearly to 15 to 20 d of withdrawal.
    - Ex. Low oil DDGS or wheat midds

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Removing pigs from high fiber diets

- Not the same as removal from diets with high levels of unsaturated fat!

Yield

Shorter withdrawal

Fat quality

Longer withdrawal

Phytase Introduction

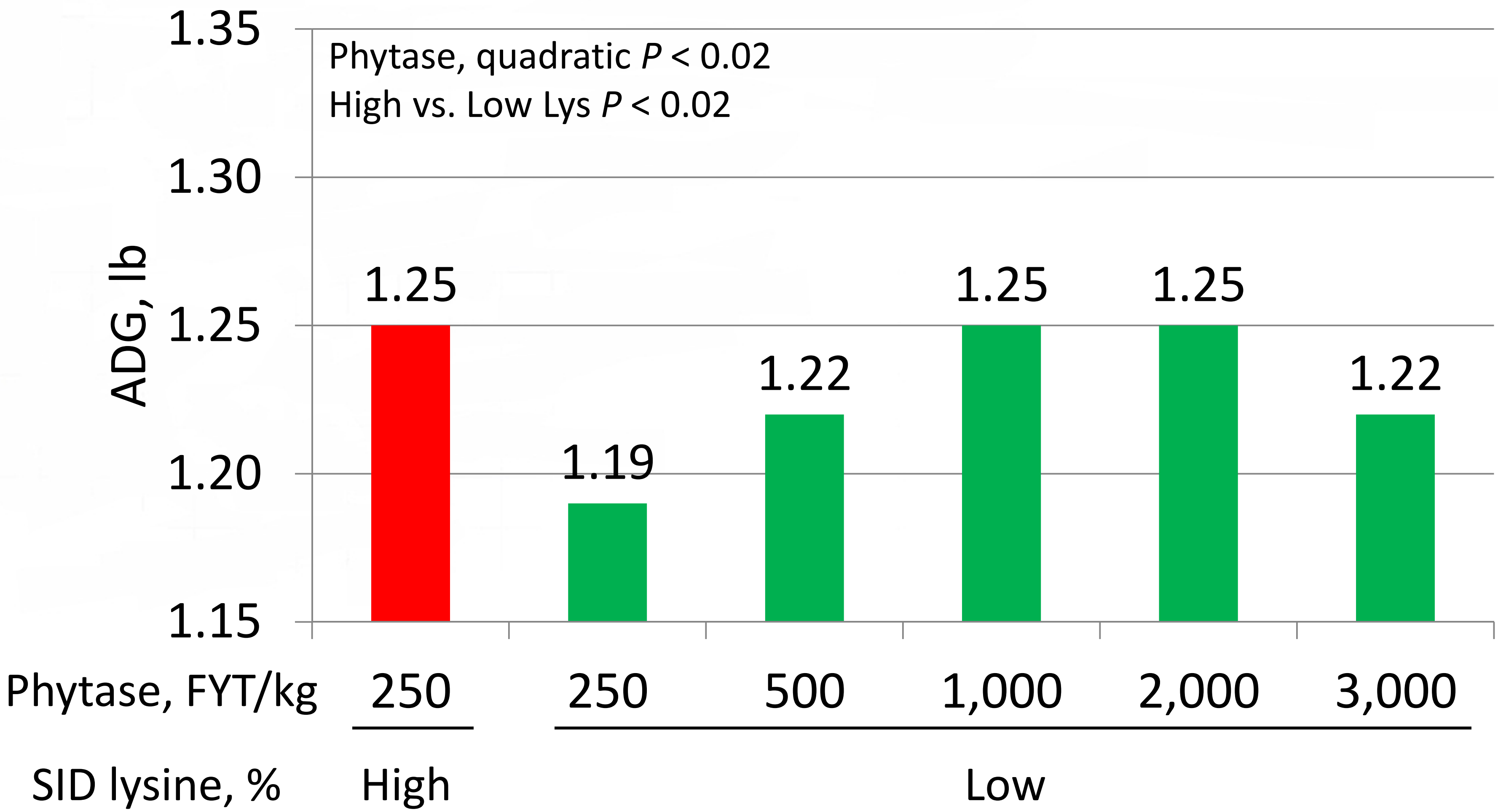
- Phytase is routinely added to swine diets to improve utilization of phytate-bound phosphorus within cereal grains which is typically unavailable to the animal.

- Additions of phytase at amounts greater than that needed to meet the P requirement, “superdosing”, could potentially increase digestibility of nutrients other than P and result in improved gain and feed efficiency.

Phytase Introduction

- Studies were conducted in commercial research facilities as well as the KSU STRC.
- Three sources of phytase were used:
  - Ronozyme HiPhos, Optiphos, and Quantum.
- Exp. 1 and 2 evaluated the effects of phytase in low-lysine diets compared with a high lysine positive control.
- Exp. 3 and 4 used existing diets with phytase added on top of a nutritionally adequate diet.

Effects of increasing Ronozyme HiPhos in low lysine diets on nursery pig growth performance (d 0 to 36)



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DSM

Langbein et al., 2013

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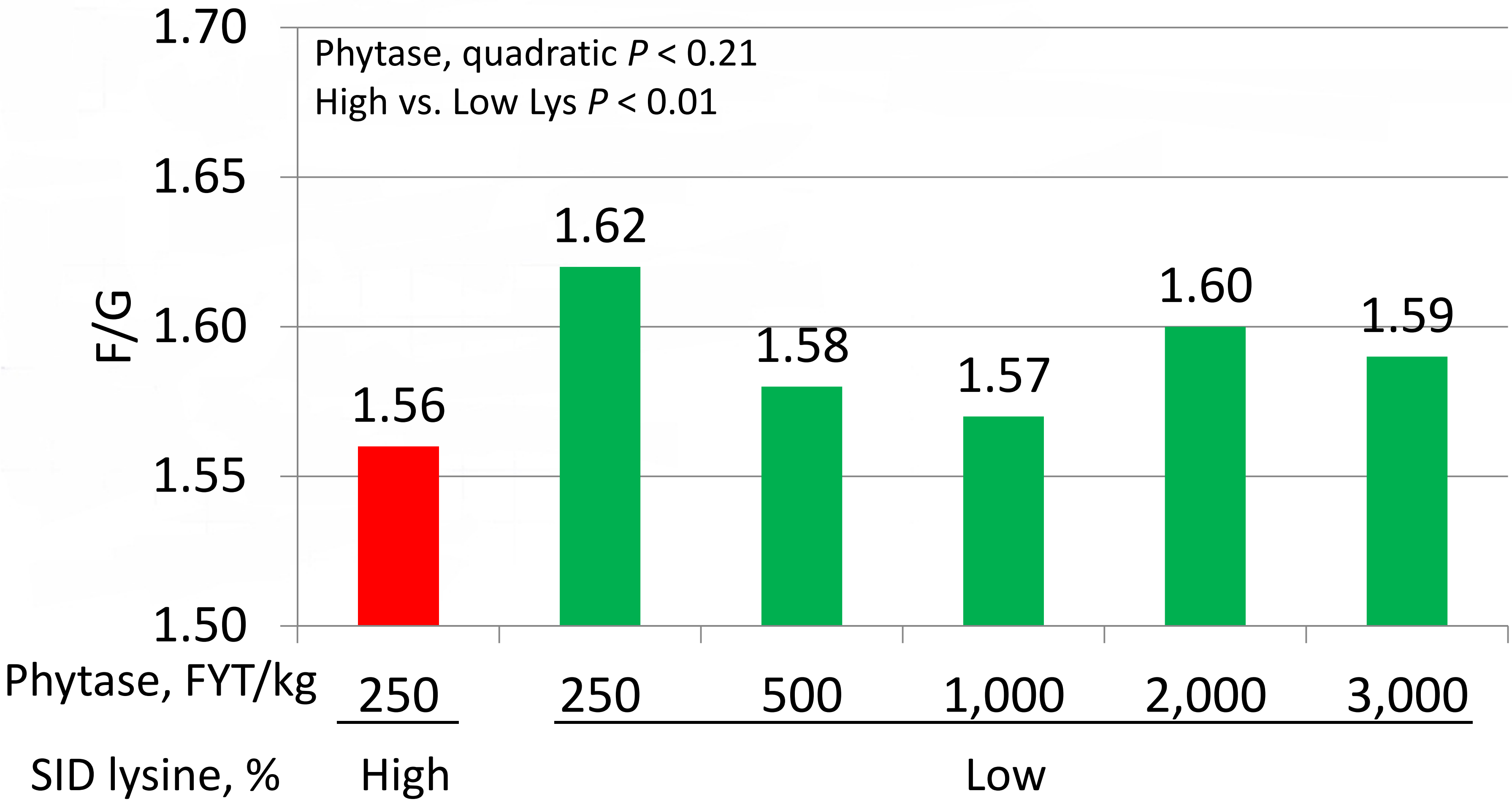
Effects of increasing Ronozyme HiPhos in low lysine diets on nursery pig growth performance (d 0 to 36)



K-STATE Research and Extension | NEW HORIZON FARMS | DSM

Langbein et al., 2013

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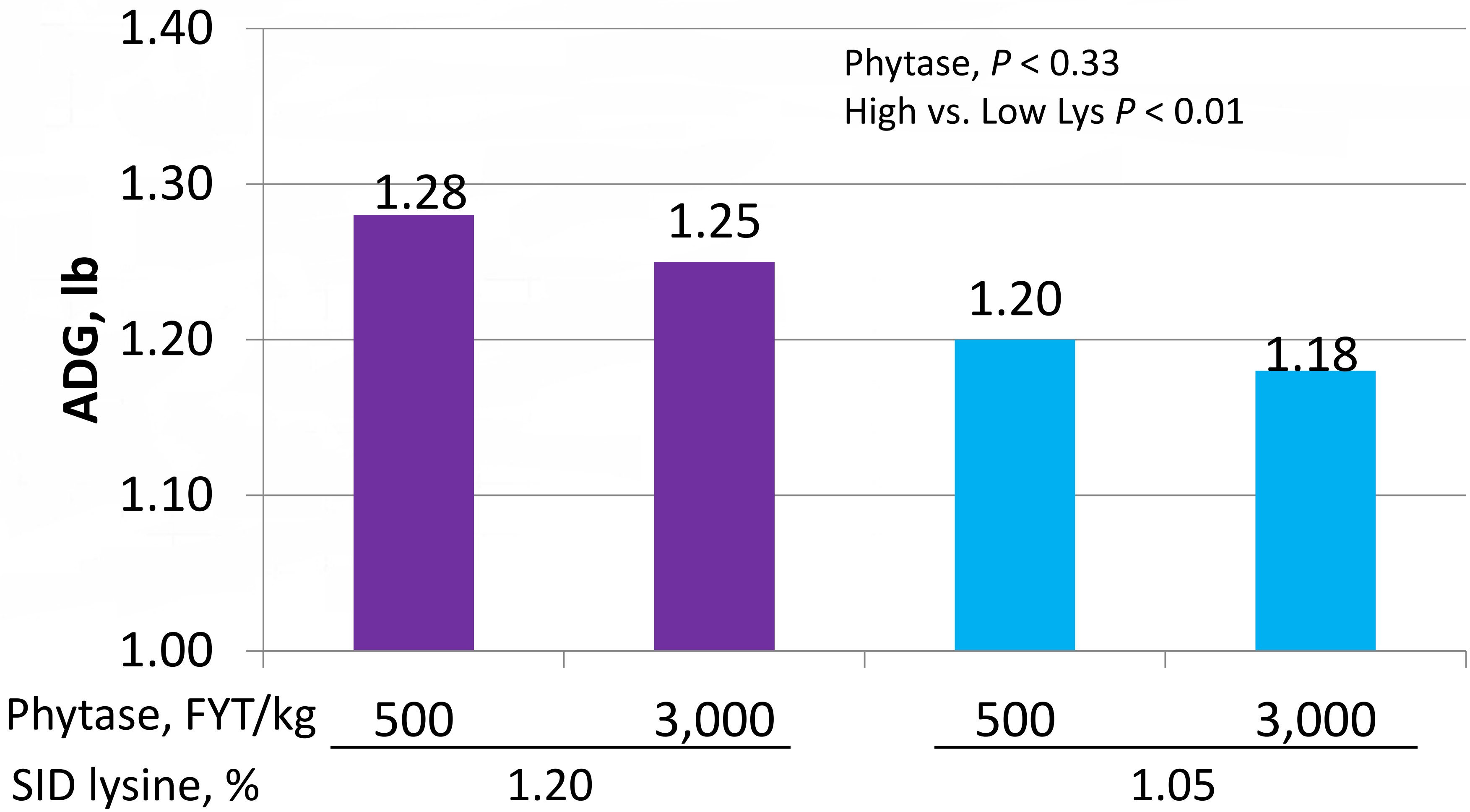
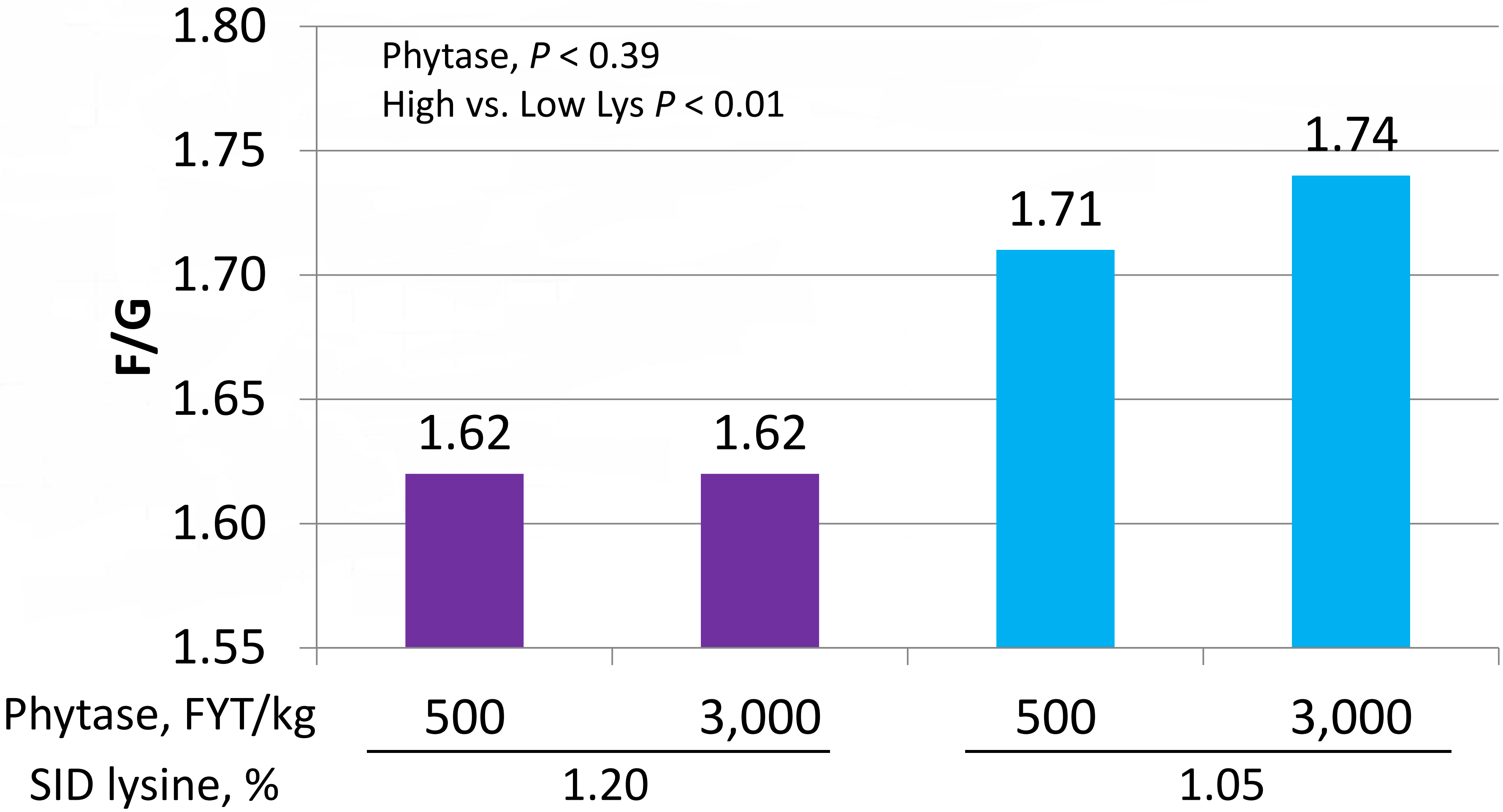
Influence of added Ronozyme HiPhos in low or high lysine diets on growth performance of nursery pigs (d 0 to 18)



Langbein et al., 2013

Influence of added Ronozyme HiPhos in low or high lysine diets on growth performance of nursery pigs (d 0 to 18)



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Langbein et al., 2013

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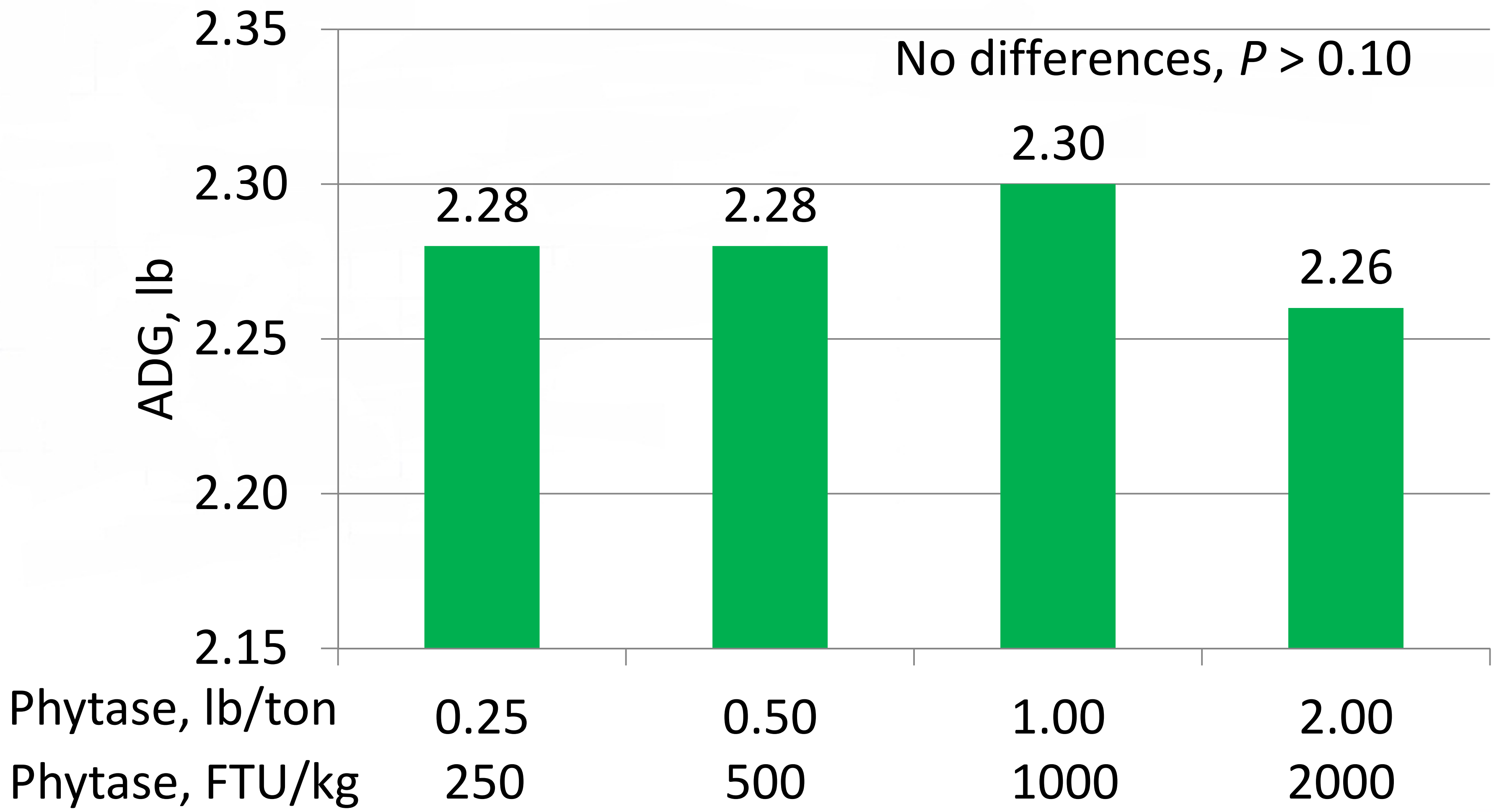
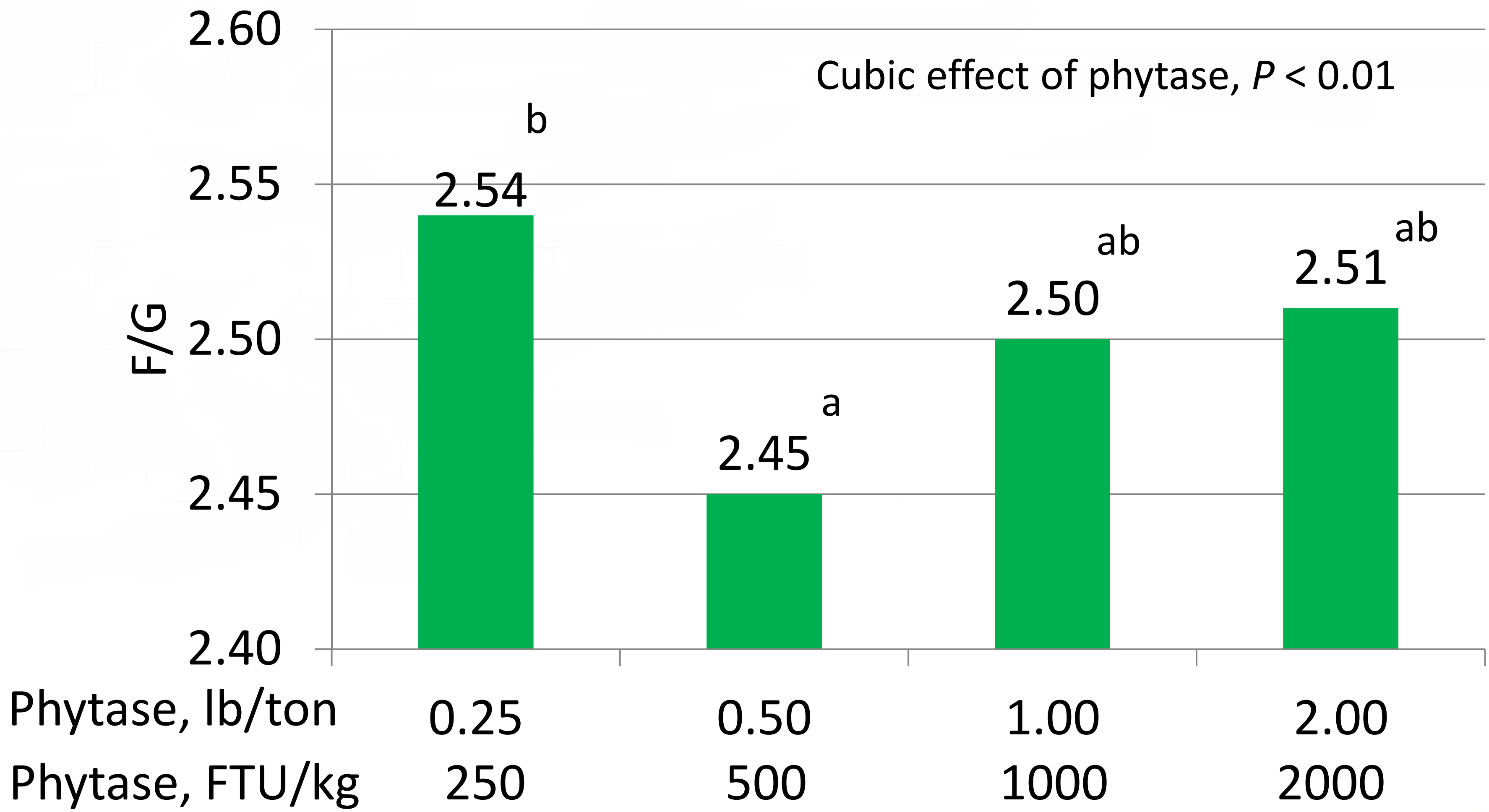
Effects of increasing Optiphos 2000 in growth performance of finishing pigs (d 0 to 92)



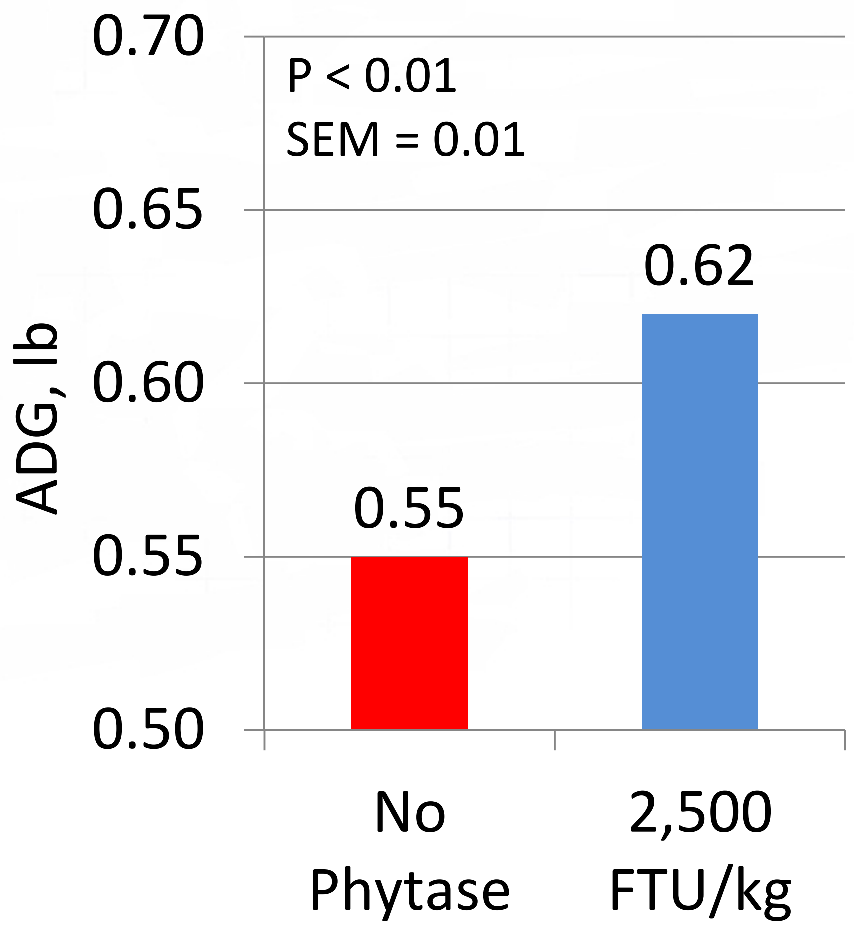
Goodband et al., 2013

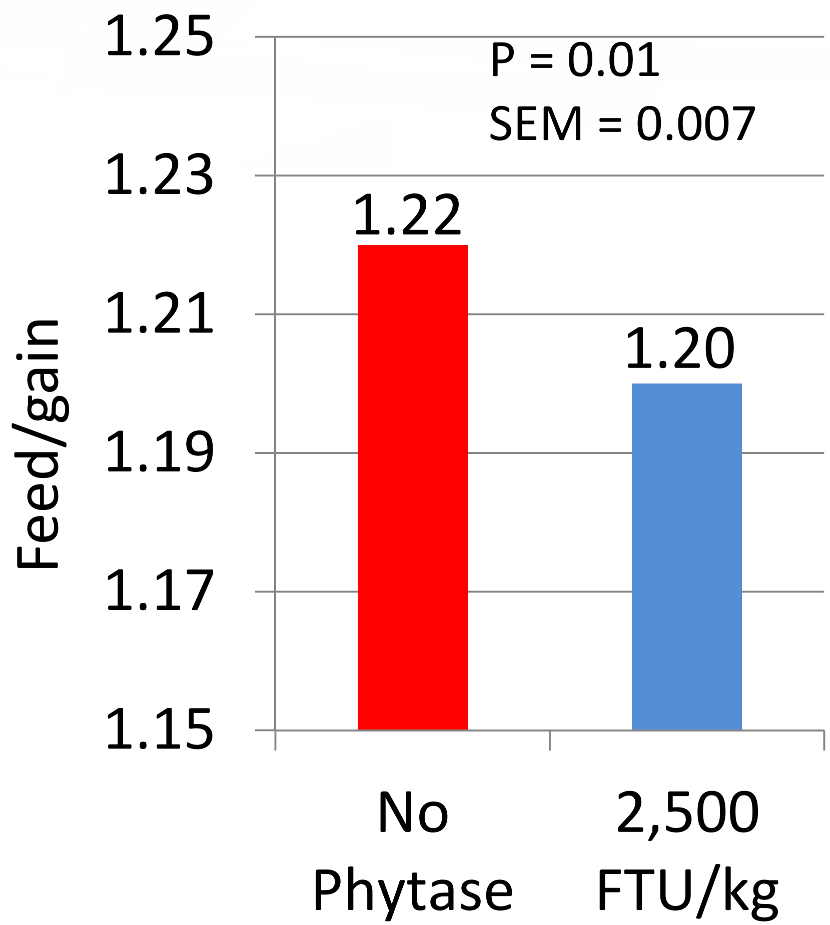
Effects of increasing Optiphos 2000 in growth performance of finishing pigs (d 0 to 92)



Goodband et al., 2013

Effects of superdosing Quantum phytase on growth performance of weanling pigs; Commercial facilities (d 0 to 21)





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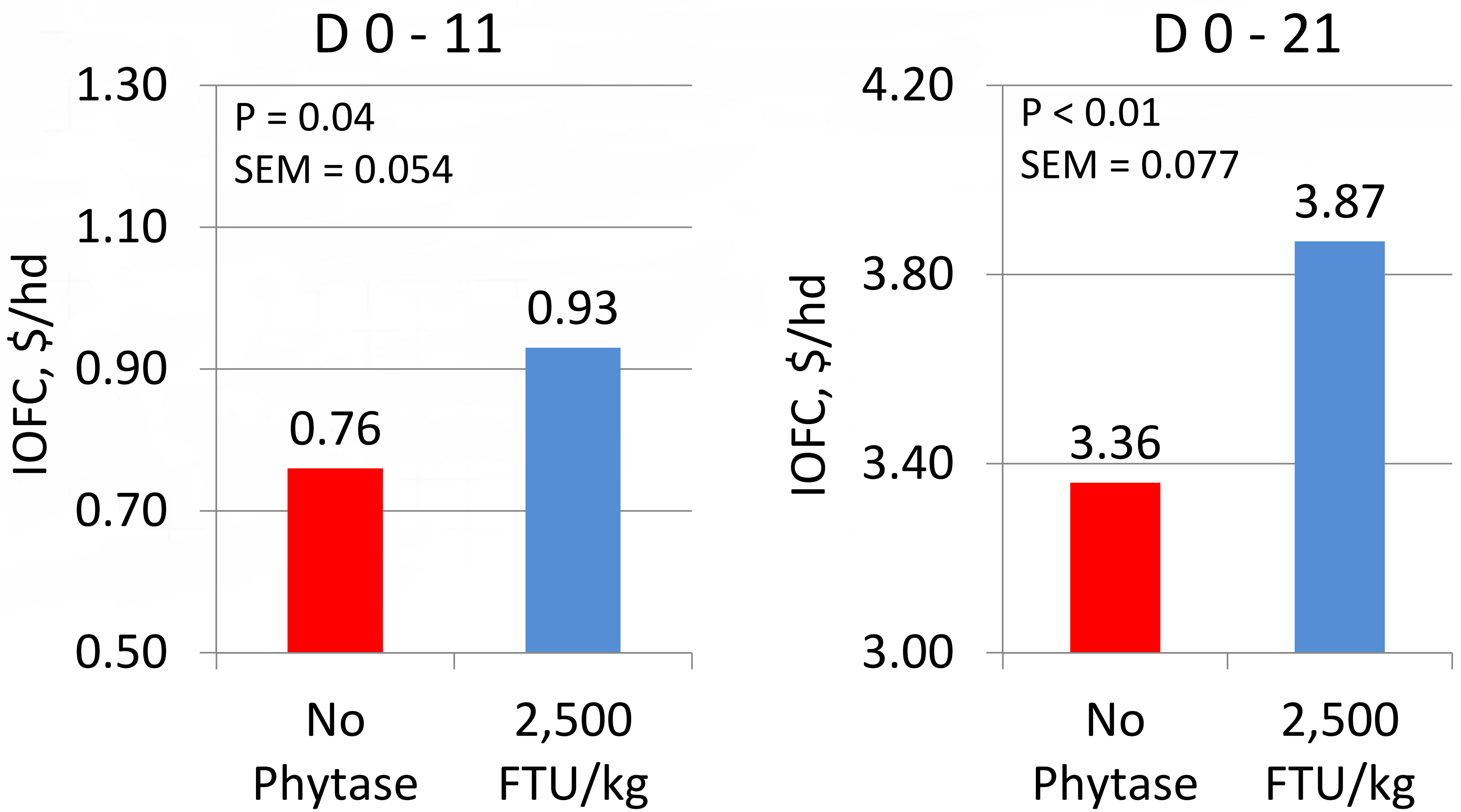
HORD LIVESTOCK CO., INC. Feeding Families Through Sustainable Food Production

Knowledge for Life

Effects of superdosing Quantum phytase on IOFC for weanling pigs



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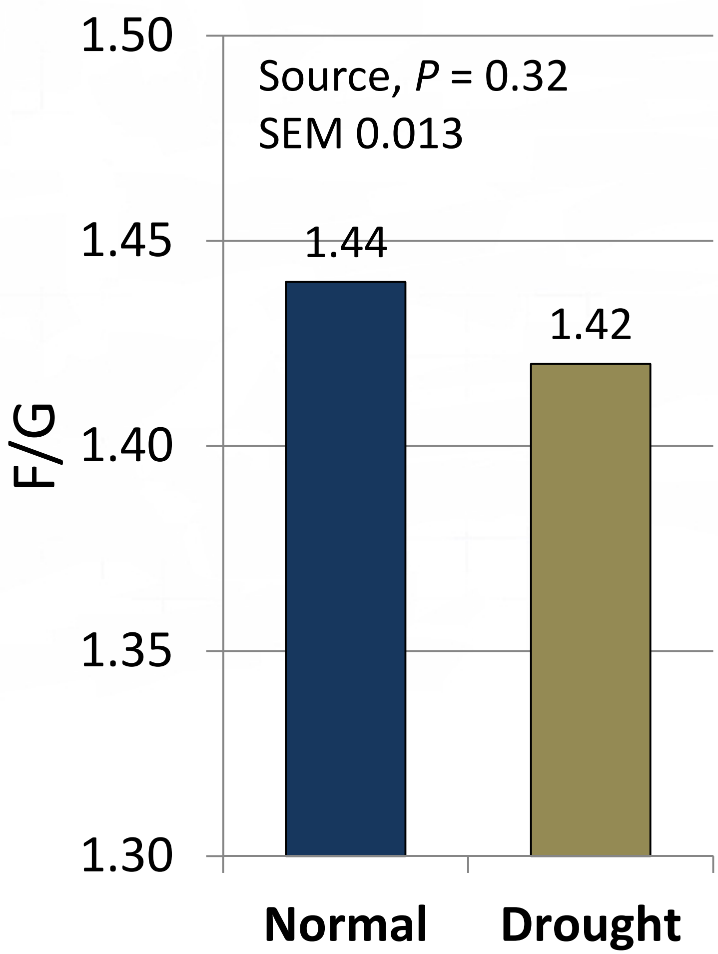
HORD LIVESTOCK CO., INC. Feeding Families Through Sustainable Food Production

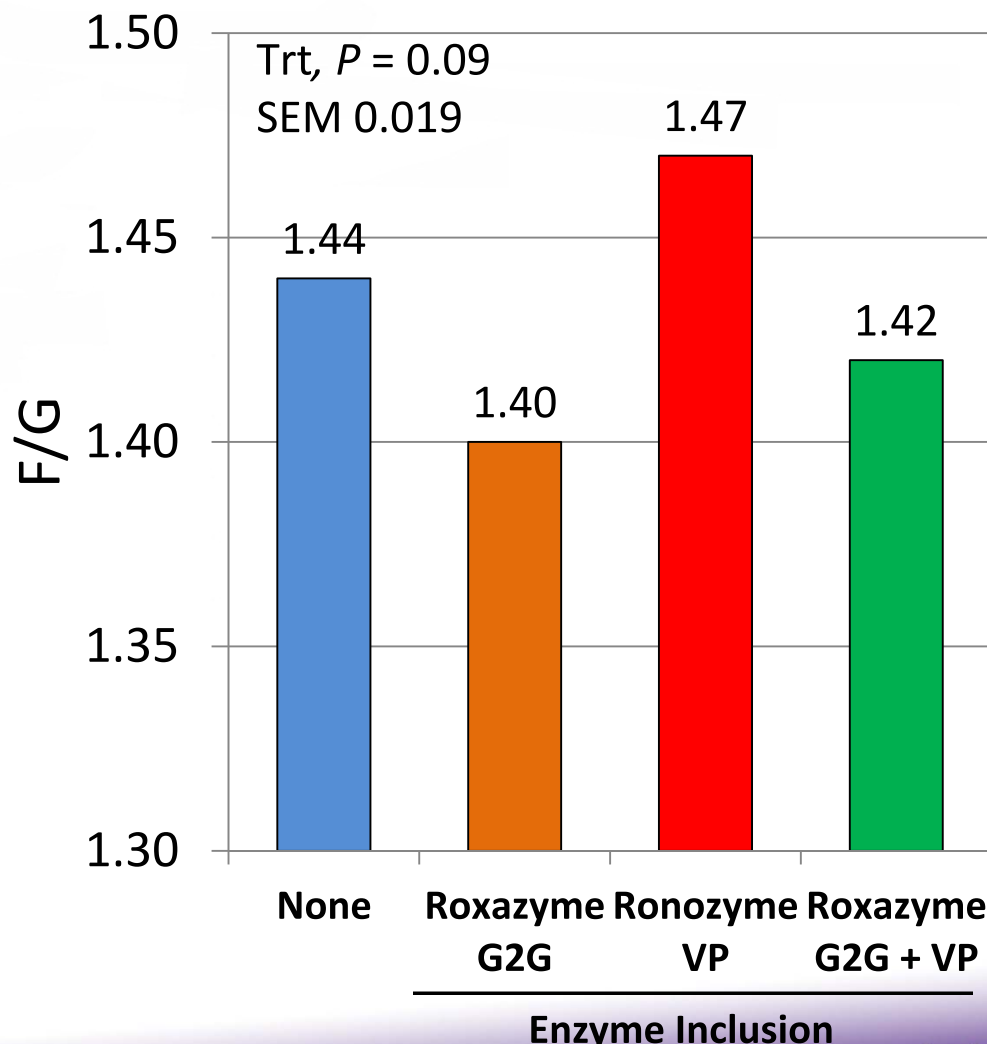
Knowledge for Life

Summary of superdose phytase trials

- Similar to previous studies, these experiments emphasize the importance of adequate lysine to promote growth performance.
- These studies also illustrate the differences between experiments conducted in university vs. commercial setting because a phytase response was detected only in the commercial studies.
- Although very cautious to lower lysine with increasing phytase, there could be benefits to increasing phytase above that needed for the P requirement.

Drought-affected corn and/or carbohydrase enzyme inclusion on F/G (d 10-35 post-weaning)





Jones et al., 2013

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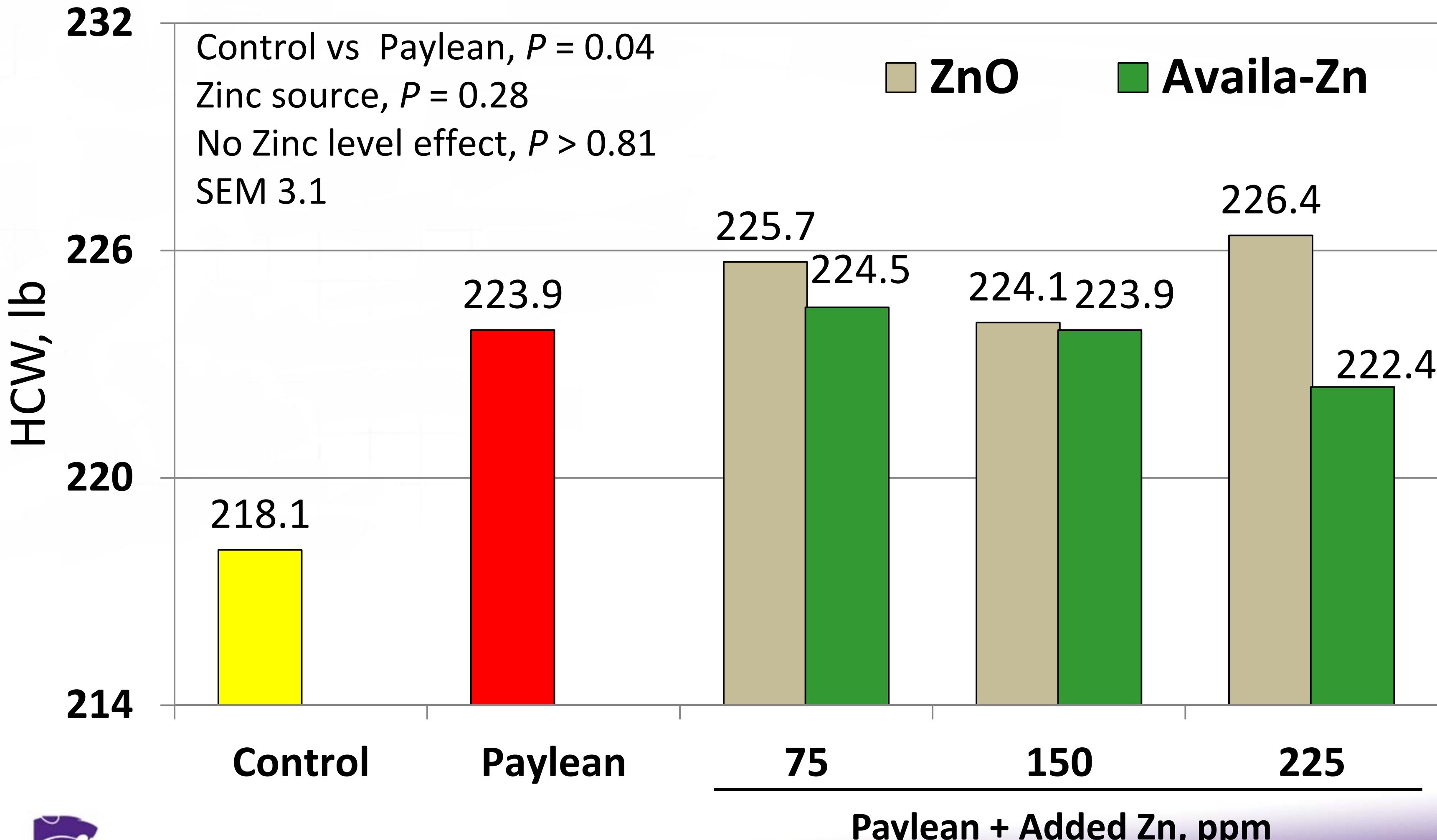
DSM

Knowledge for Life

Additional Zinc in Paylean Diets

- Recently, data has suggested that pigs feed additional zinc above that provided in the trace mineral premix can improve growth.
- More research was needed to evaluate zinc source and added levels for optimum growth and economic return.
- Additionally, more data was needed to understand “why” this response was occurring when pigs are being fed Paylean.

Zinc level and source with Paylean on Hot Carcass Weight - Exp. 1 (d 0 to 35)



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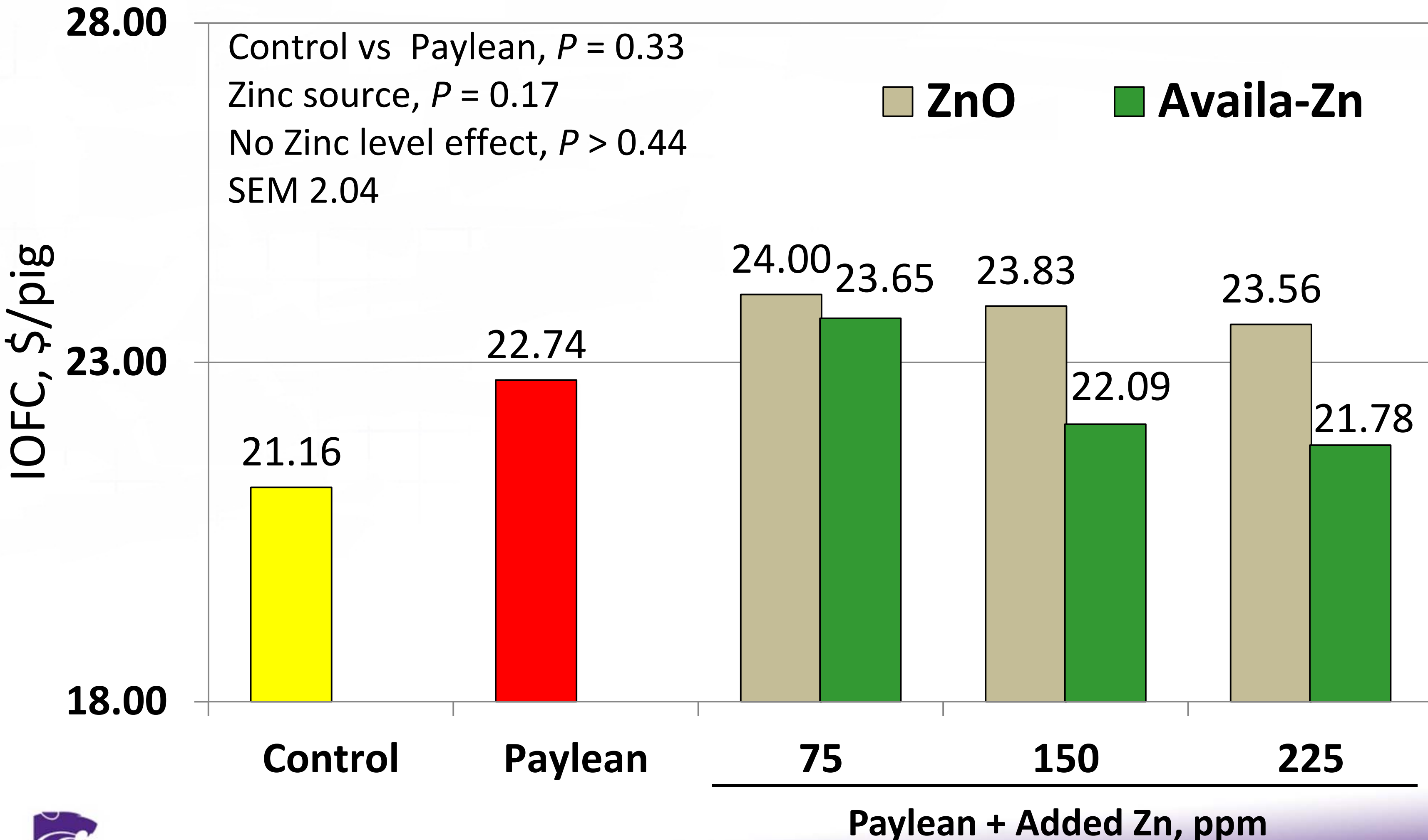
Elanco

Paulk et al., 2013

Knowledge for Life

Zinc level and source with Paylean on Income Over Feed Cost - Exp. 1 (d 0 to 35)



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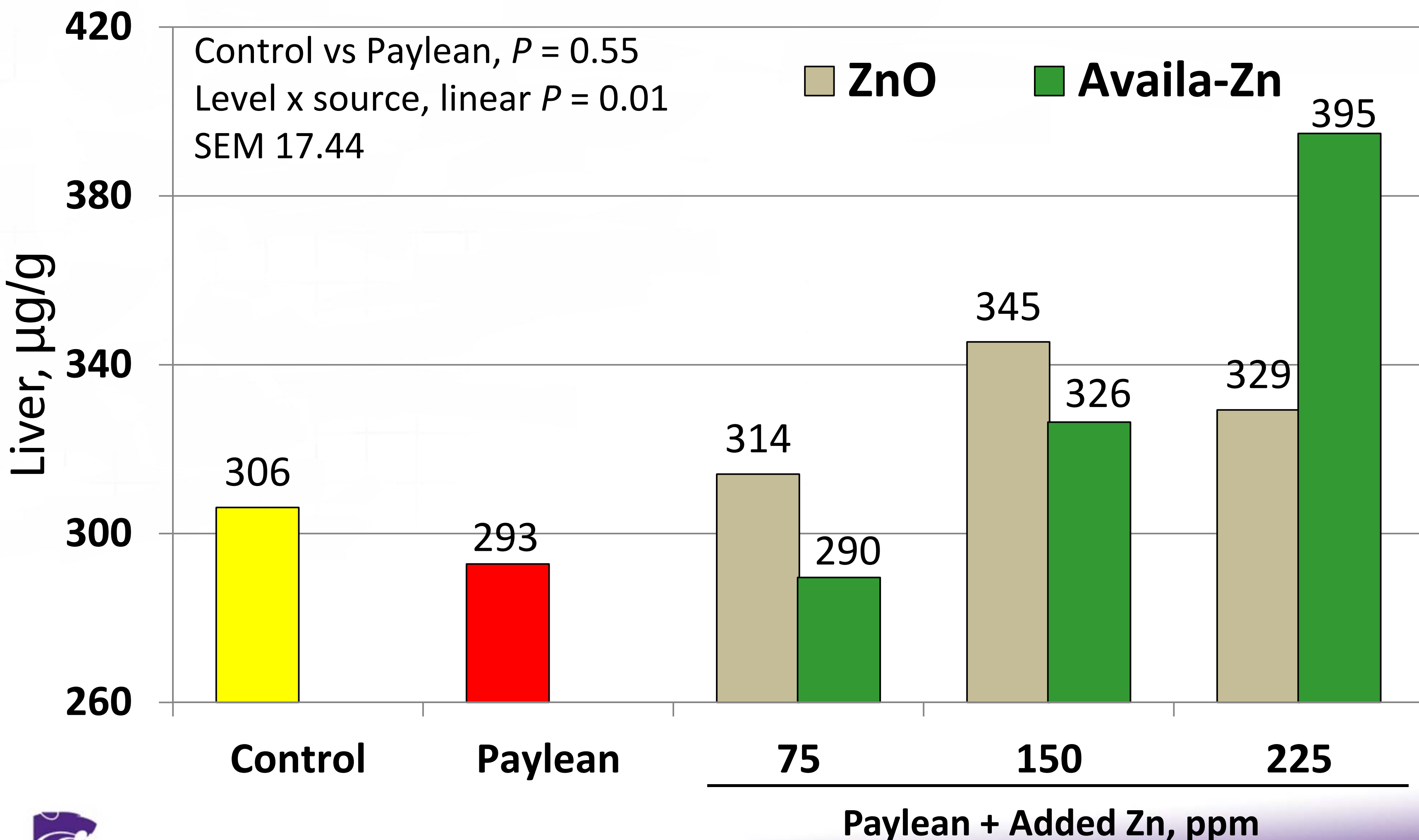
Elanco

Paulk et al., 2013

Knowledge *for* Life

Zinc level and source with Paylean on Liver Concentrations (DM basis) - Exp. 1



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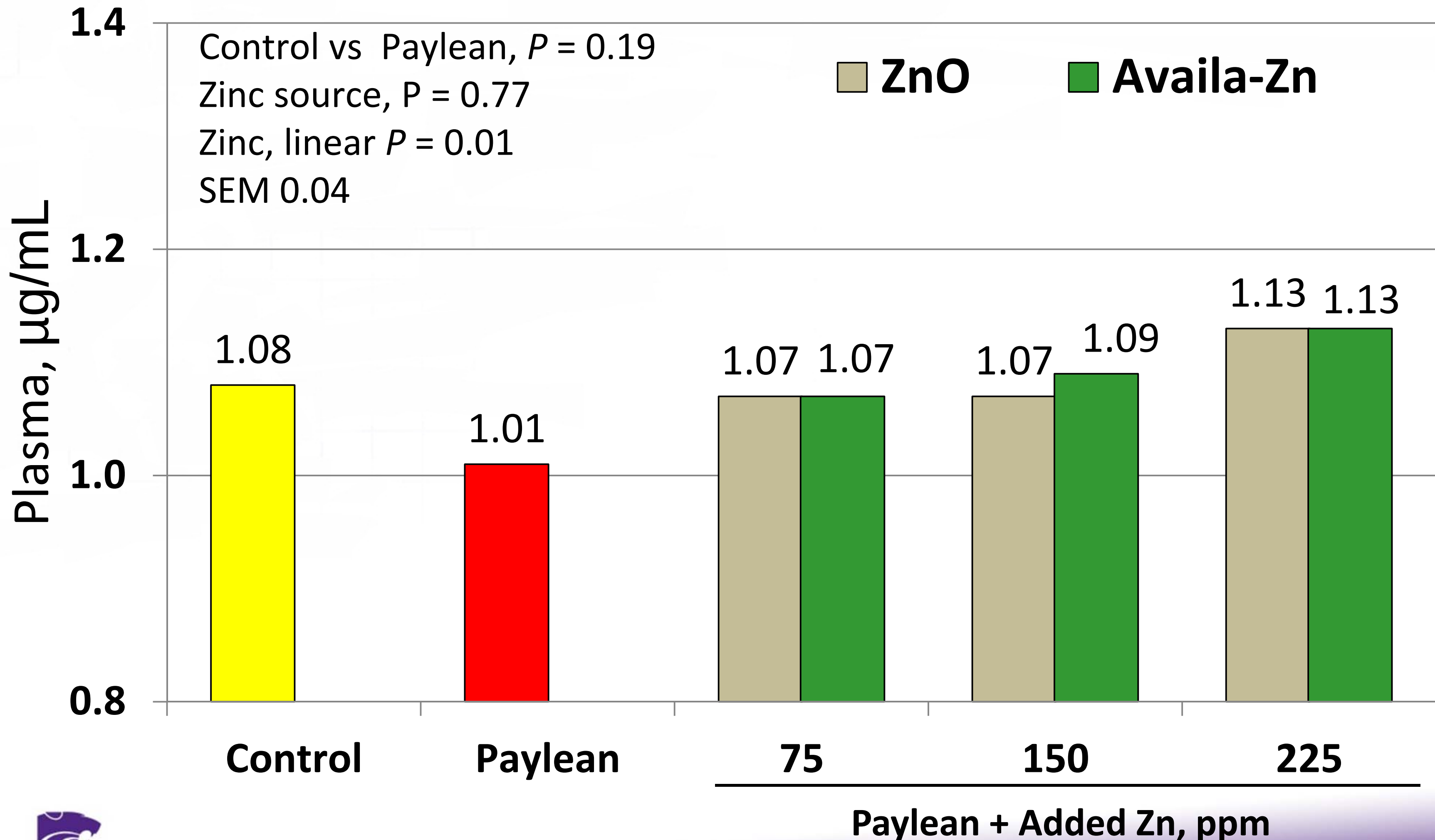
Elanco

Paulk et al., 2013

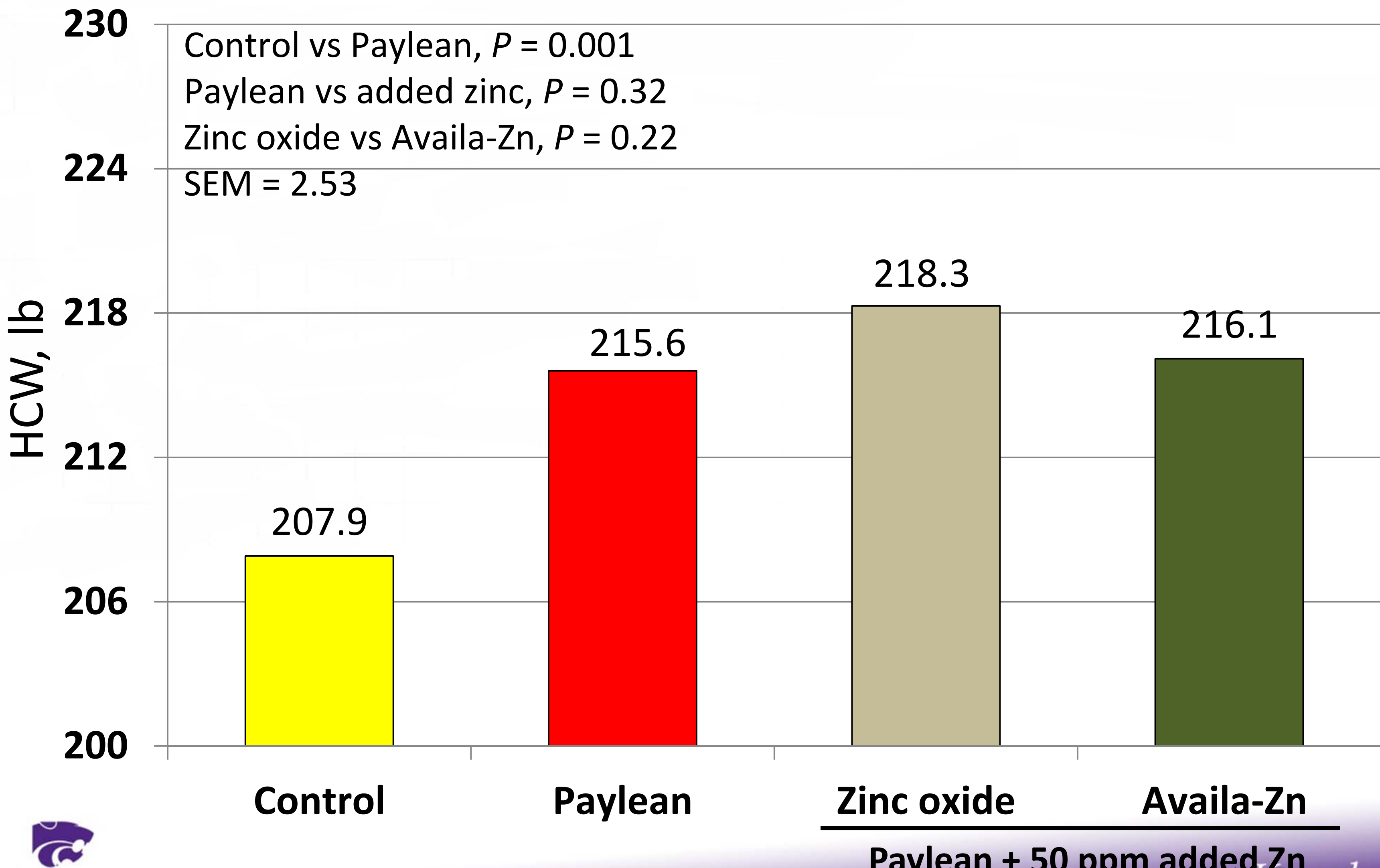
Knowledge for Life

Zinc level and source with Paylean on Plasma Zinc, Exp. 1 (d 32)



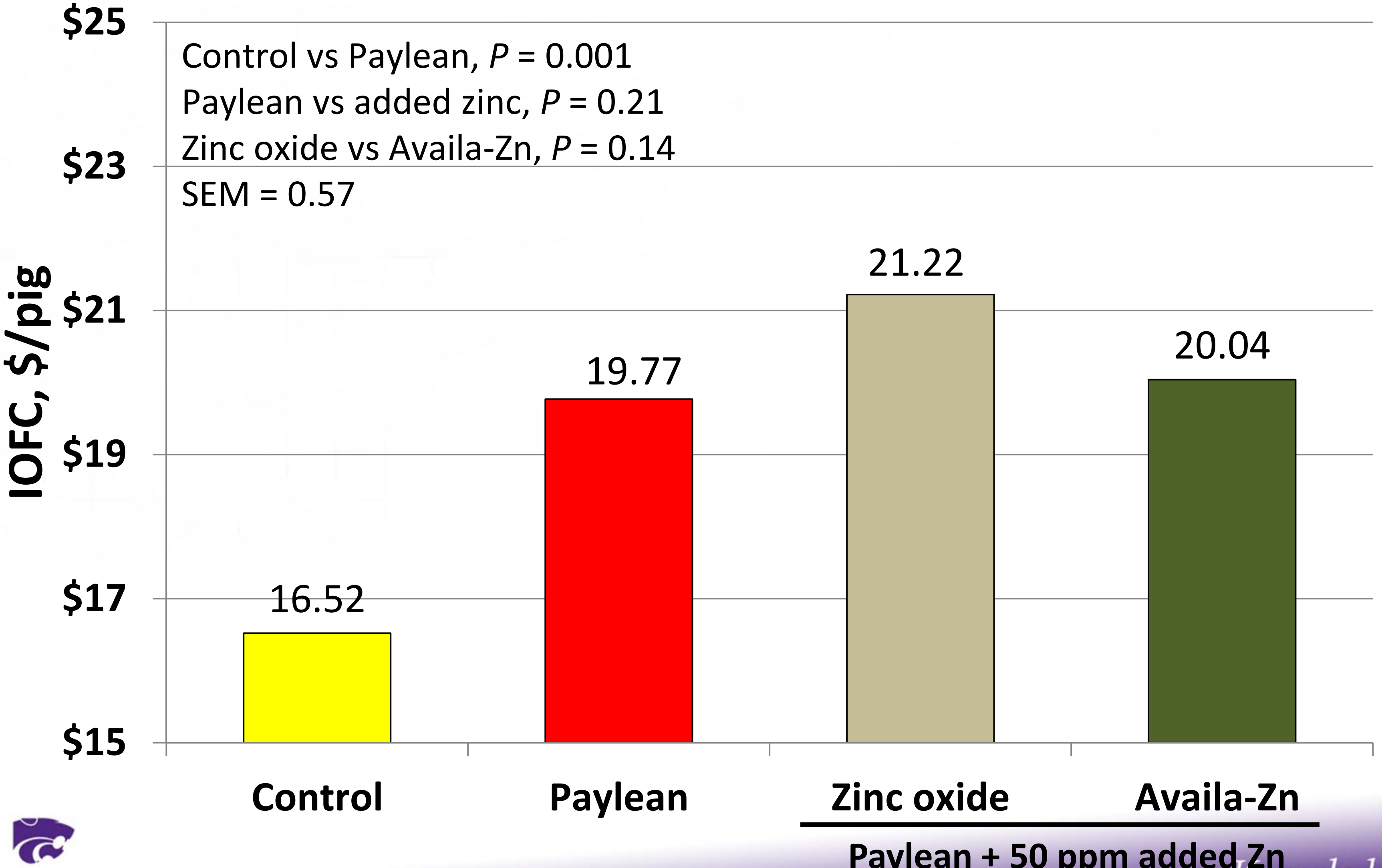
Paulk et al., 2013

Added zinc source and Paylean on Hot Carcass Weight
Exp. 2 (d 28)



Paulk et al., 2013

Added zinc source and Paylean on IOFC
Exp. 2 (d 28)



Paulk et al., 2013

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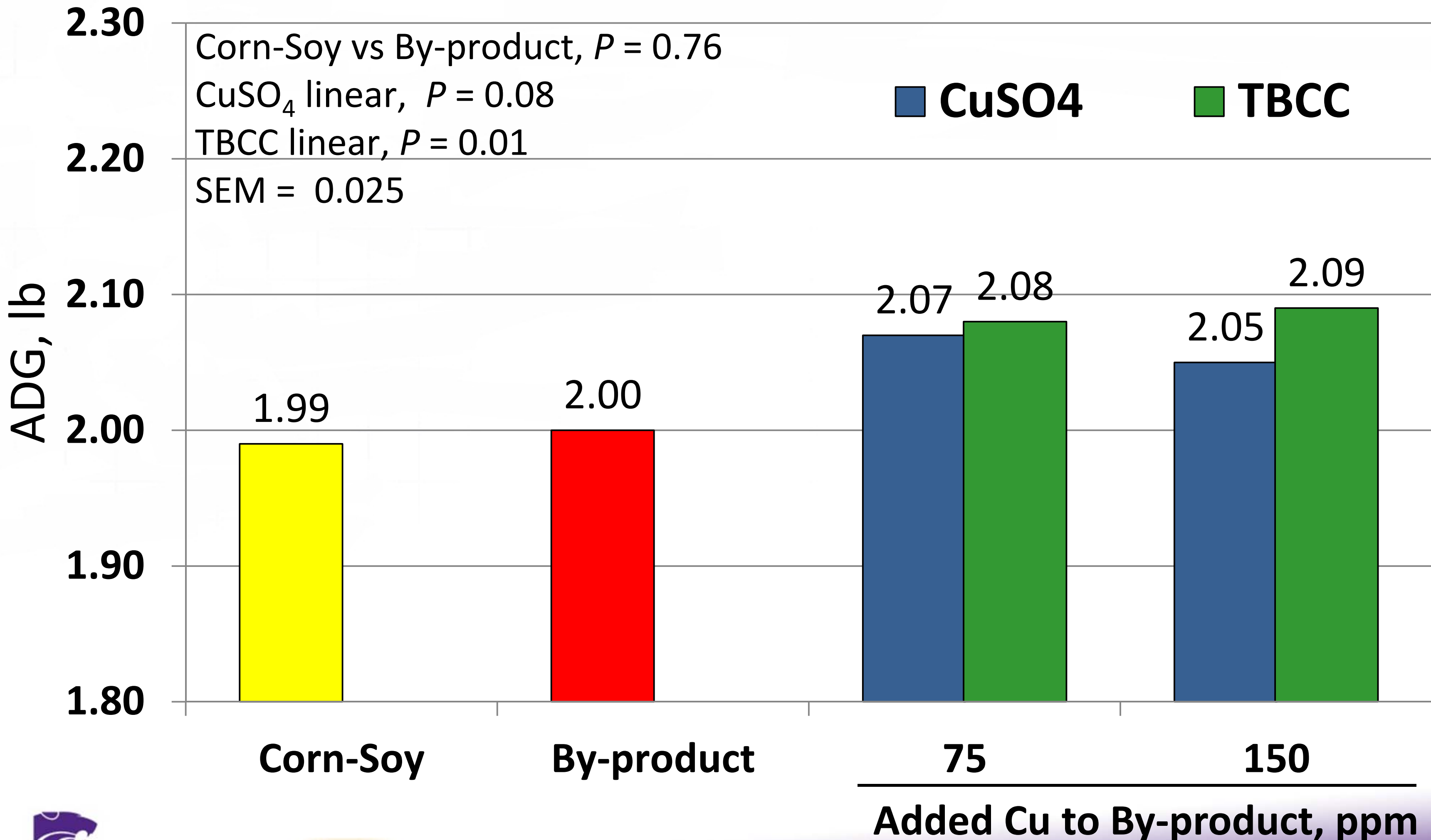
Added Zinc to the Paylean Diet Summary

- Small, but consistent improvements in growth rate have been found with added zinc in the Paylean diet.
- An additional 50 to 75 ppm added zinc has been the most economical on an IOFC basis.
- Avoid excess Zn to minimize excretion in manure.

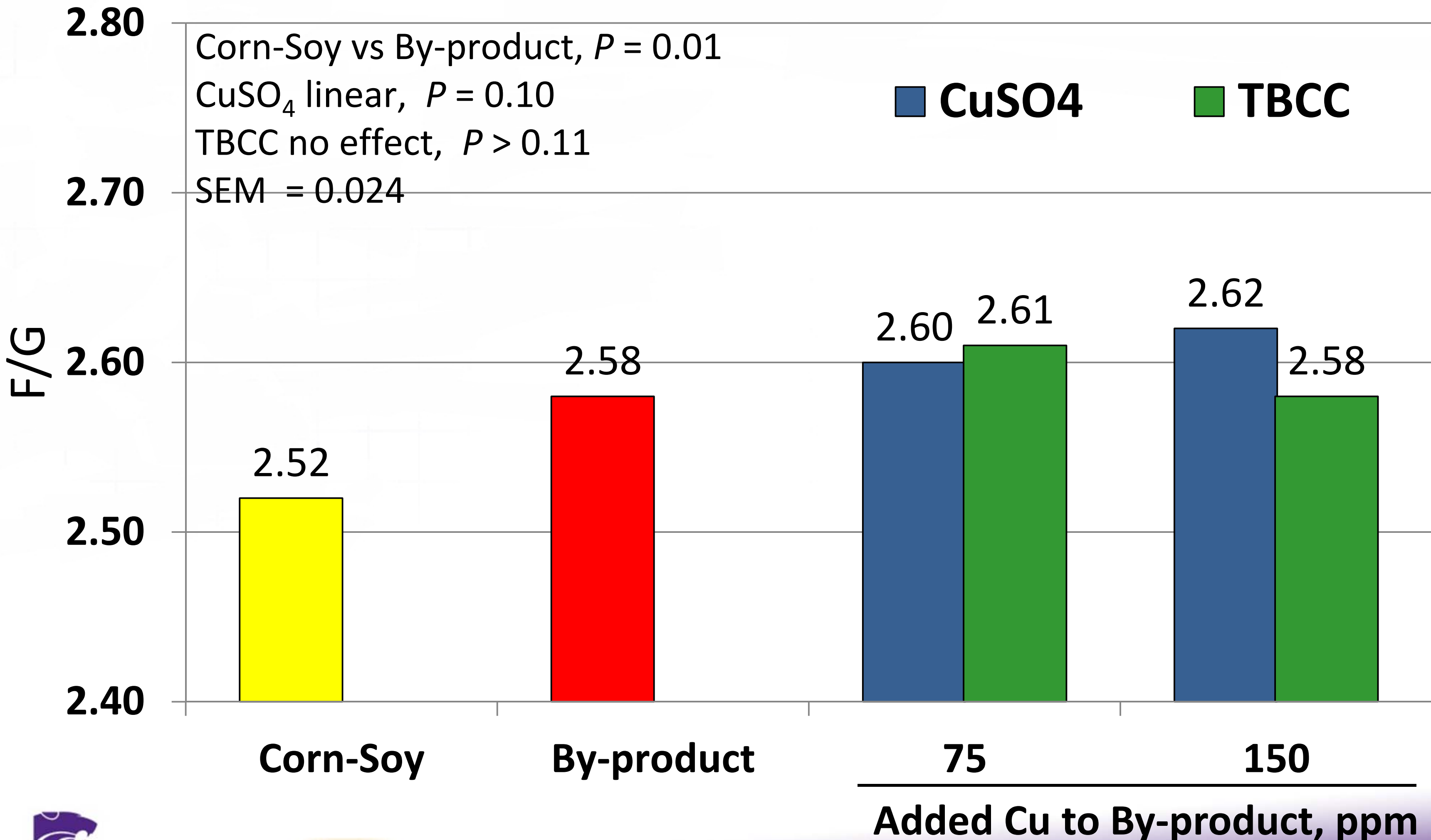
Added Cu in Growing and Finishing Pigs

- Historically added Cu above that in the trace mineral premix has been shown to improve feed intake and daily gain in the nursery, grower and early finishing.
- Industry added levels can range from 75 to 250 ppm.
- Data on tribasic copper chloride (TBCC) was limited and thus evaluated in a series of experiments.

Copper source and level on ADG (d 0 to 111)



Copper source and level on F/G (d 0 to 111)



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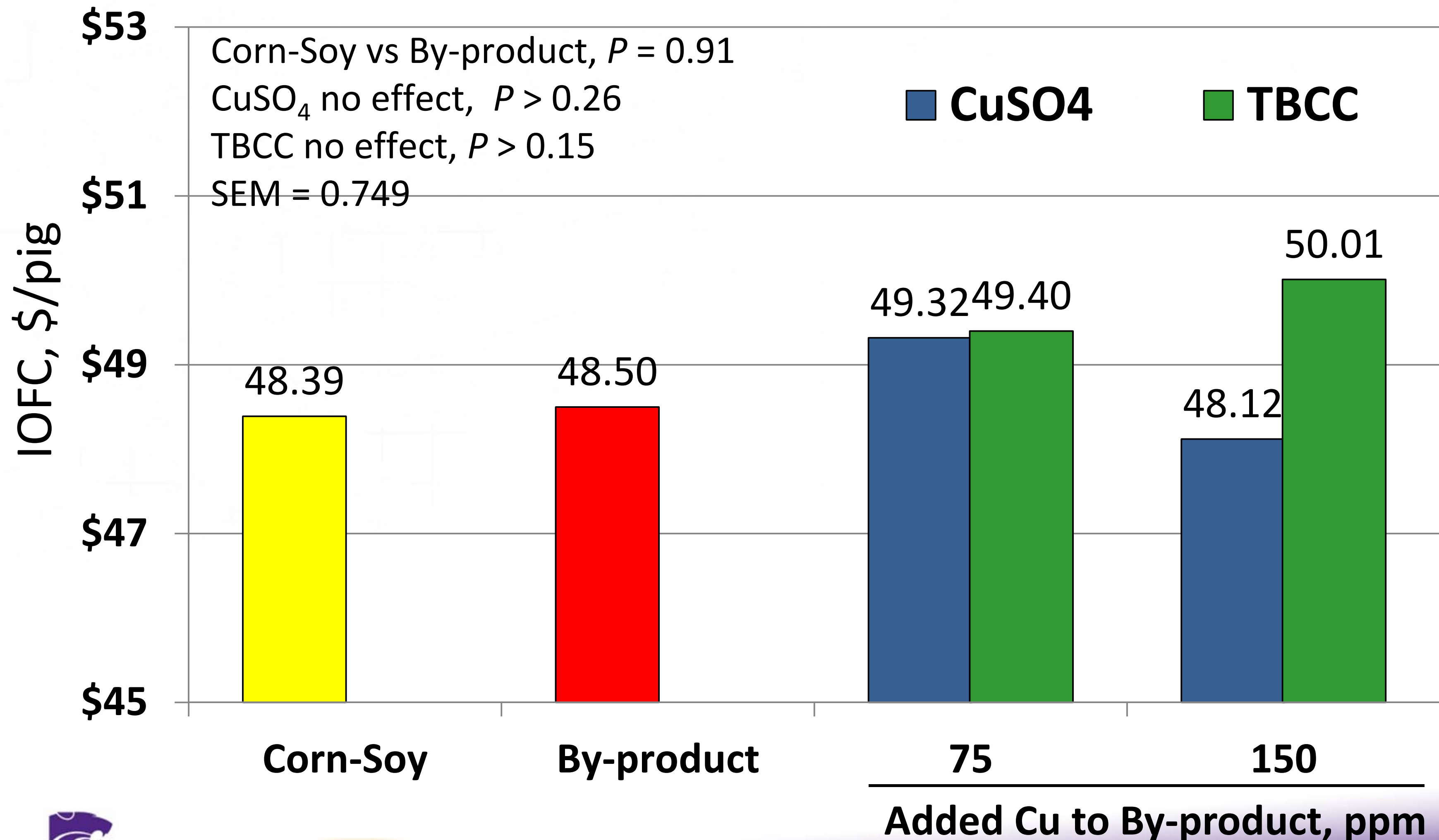
NEW HORIZON FARMS

Coble et al., 2013

Micronutrients

Knowledge for Life

Copper source and level on Income Over Feed Cost (Constant Days)



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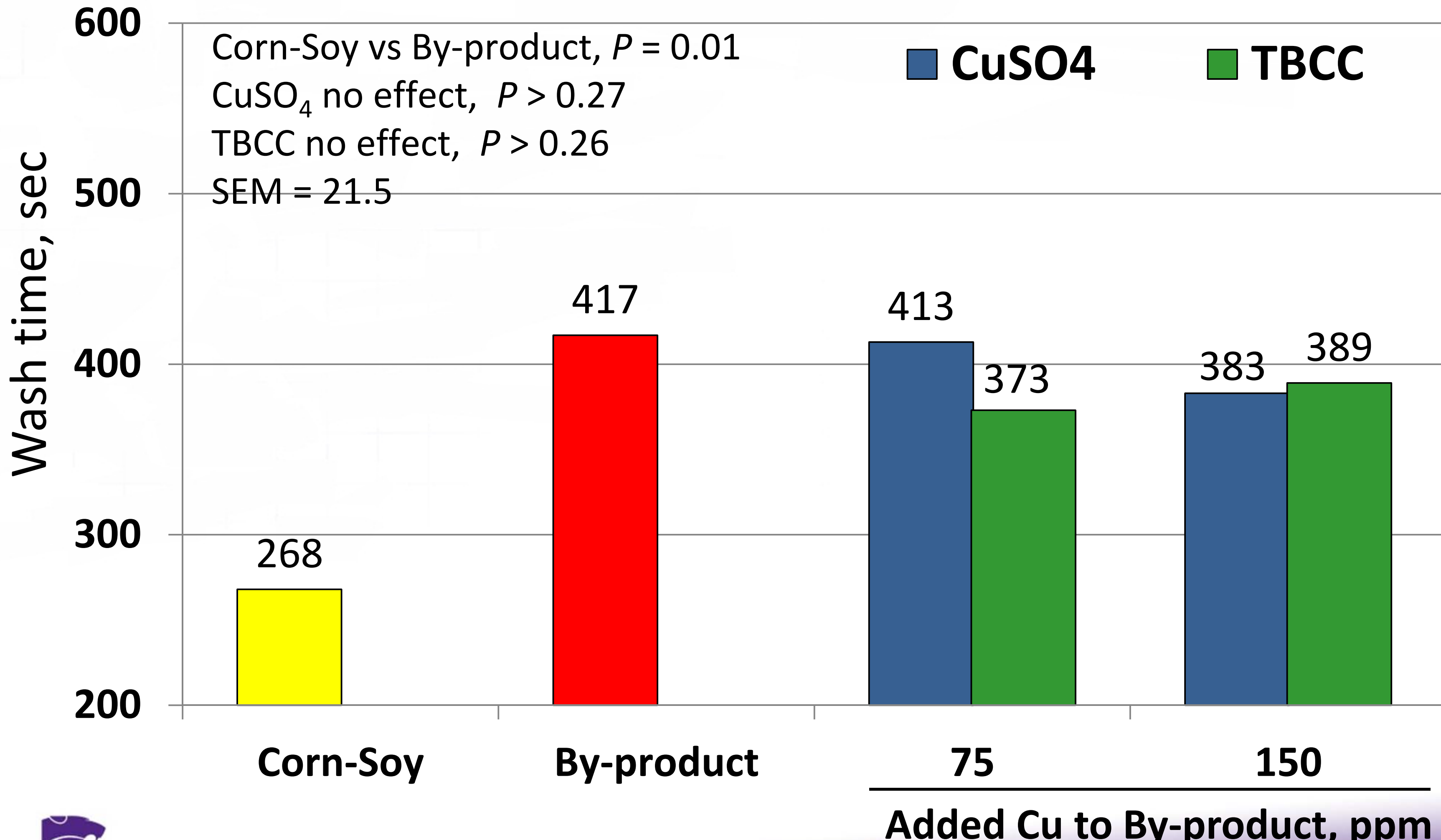
NEW HORIZON FARMS

Coble et al., 2013

Micronutrients

Knowledge for Life

Copper source and level on Pen Cleanup



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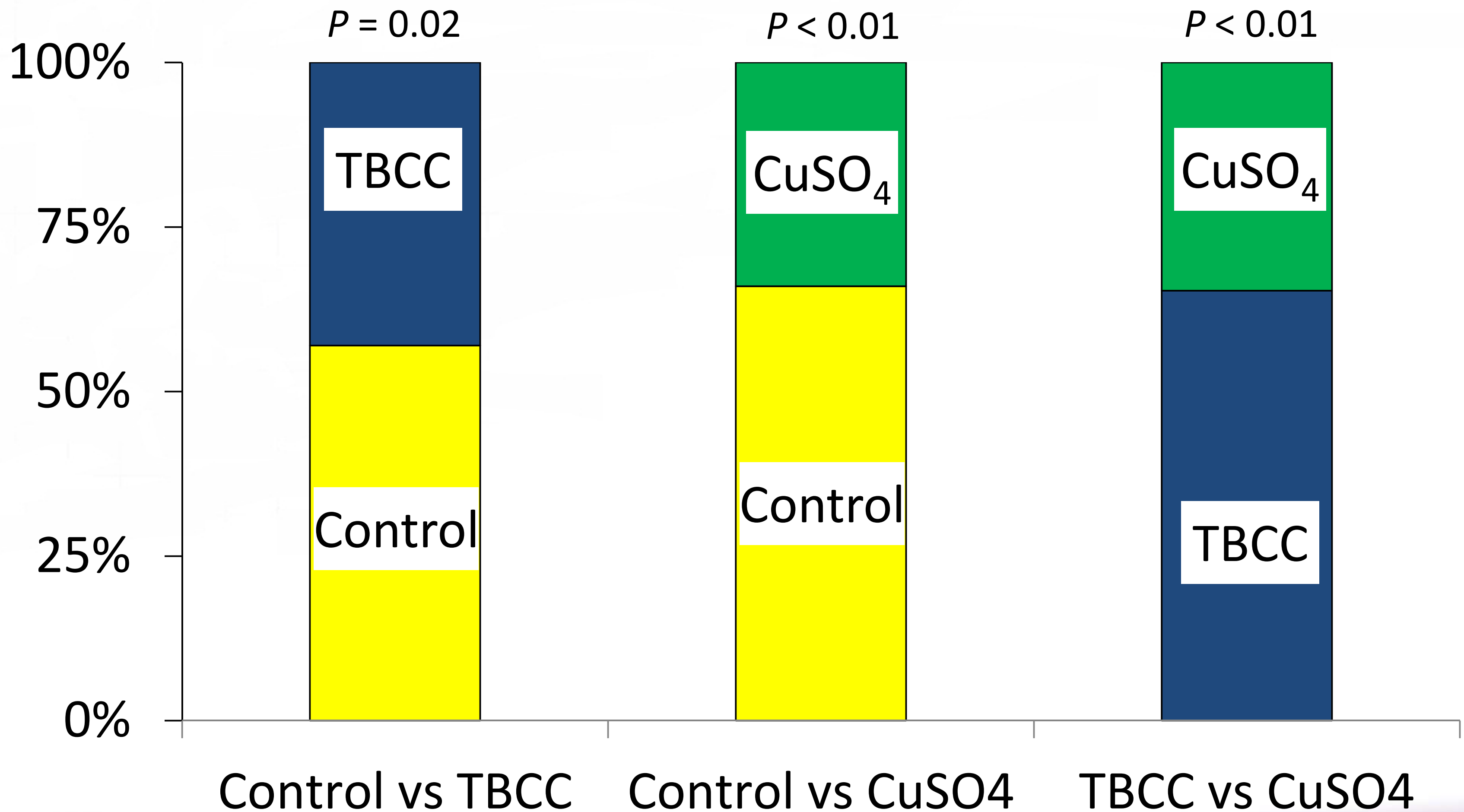
NEW HORIZON FARMS

Coble et al., 2013

Micronutrients

Knowledge for Life

Feed preference between copper sources



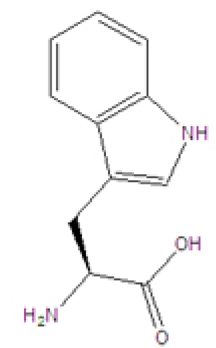
Coble et al., 2013

Added Cu Summary

- Adding supplemental copper as either $CuSO_4$ or TBCC improved growth.
- Pigs fed TBCC continued to have increased growth rate in late finishing, especially those fed 150 ppm added copper.
- When given a choice of feed, pigs eat a greater quantity of a diet without Cu. When comparing TBCC and $CuSO_4$, pigs consume a greater quantity of the diet with TBCC.

Tryptophan

- Tryptophan (Trp) is the 3rd limiting AA in swine diets based on corn and soybean meal
- Extensive use of crystalline AA in the diet to optimize feed cost has stressed the importance of accurately defining the Trp requirement
- The increasing usage of DDGS in swine diet cause Trp become more limiting due to the low-Trp in this product
- Requirement estimates for SID Trp:Lys vary from 14.5 to 23.1% across various BW ranges (Quant, 2008)



tryptophan

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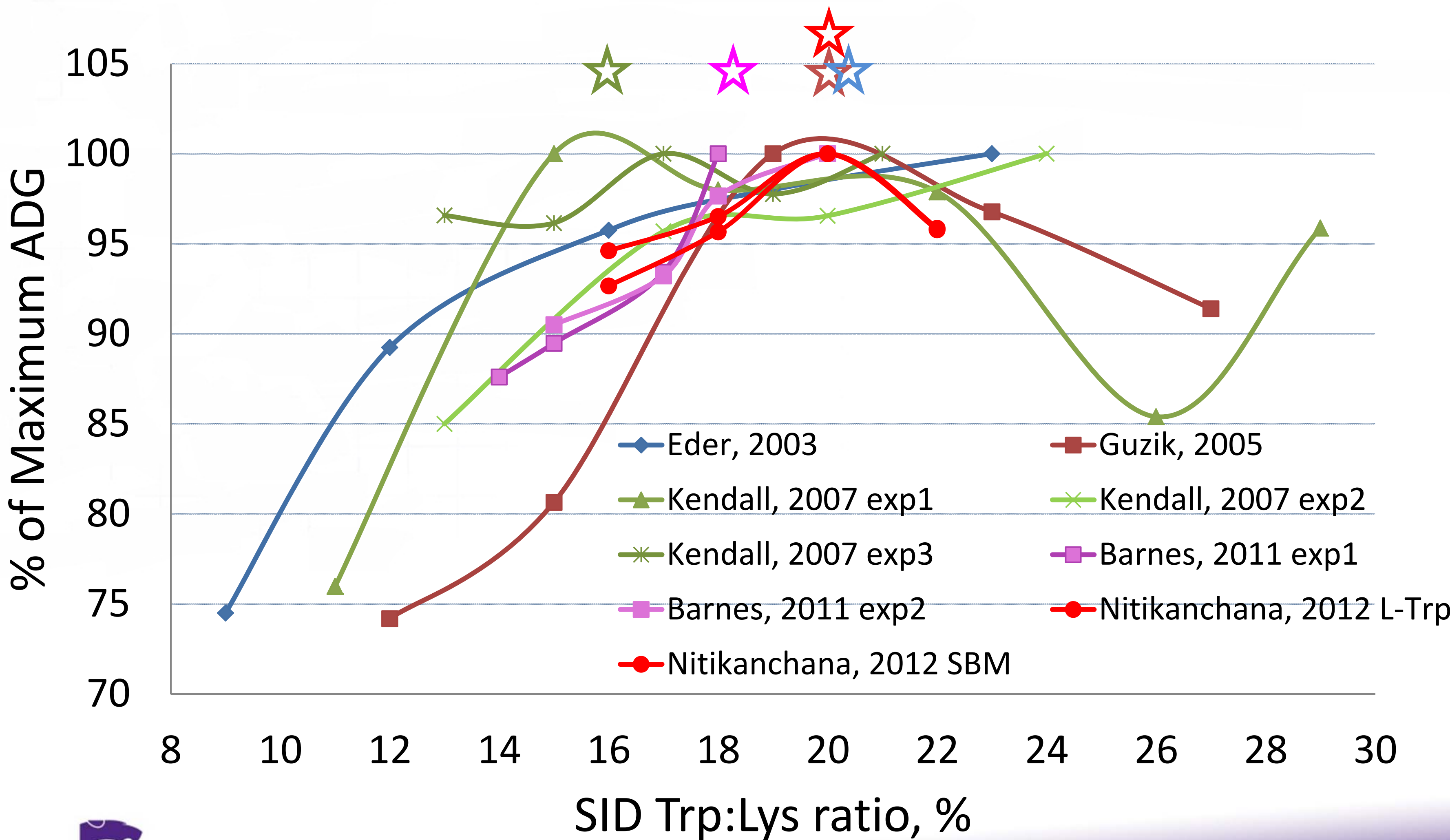
Influence of SID Trp:Lys ratio on ADG



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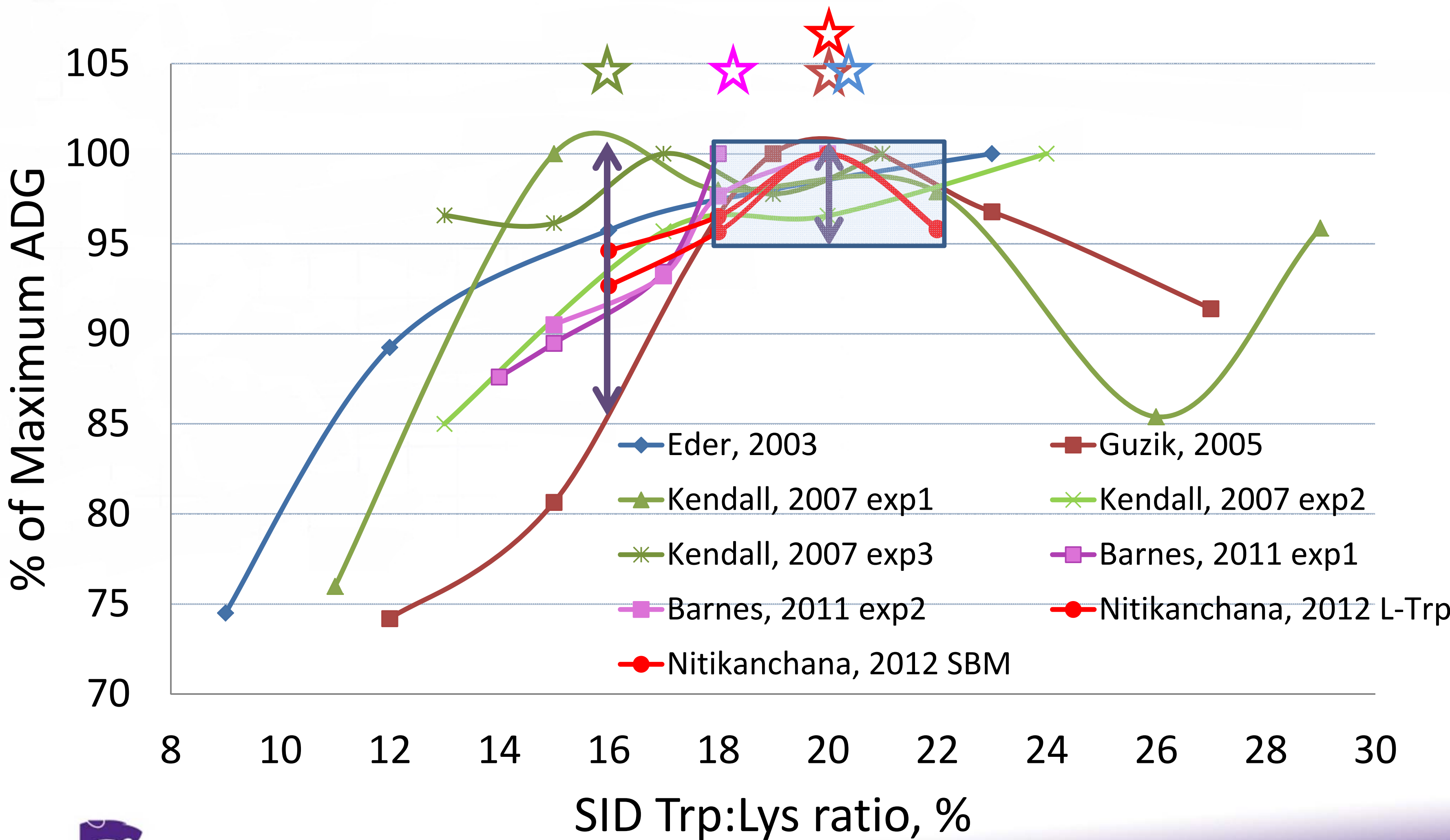
Influence of SID Trp:Lys ratio on ADG



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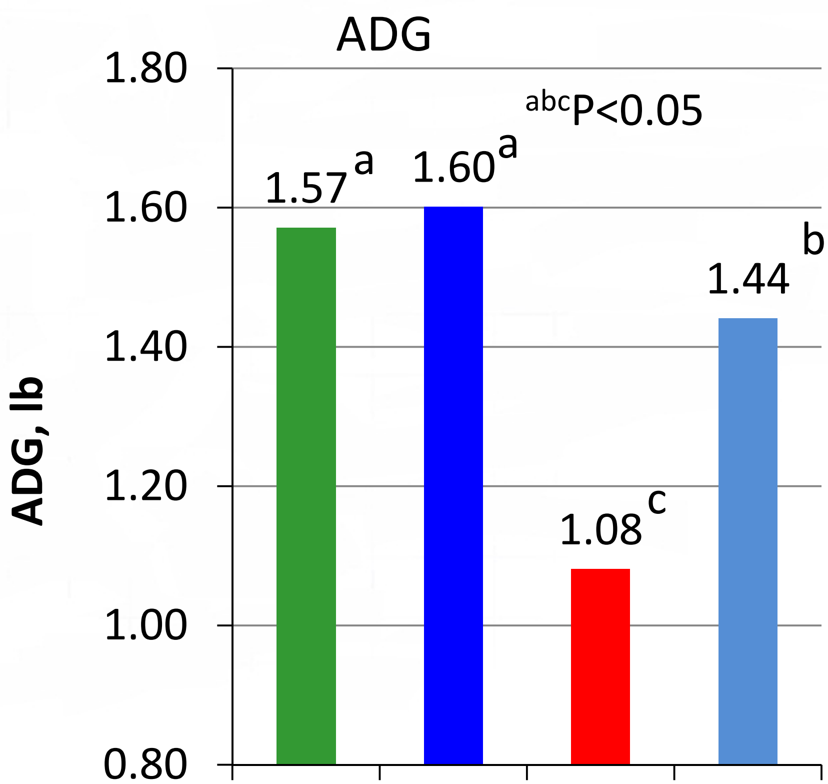
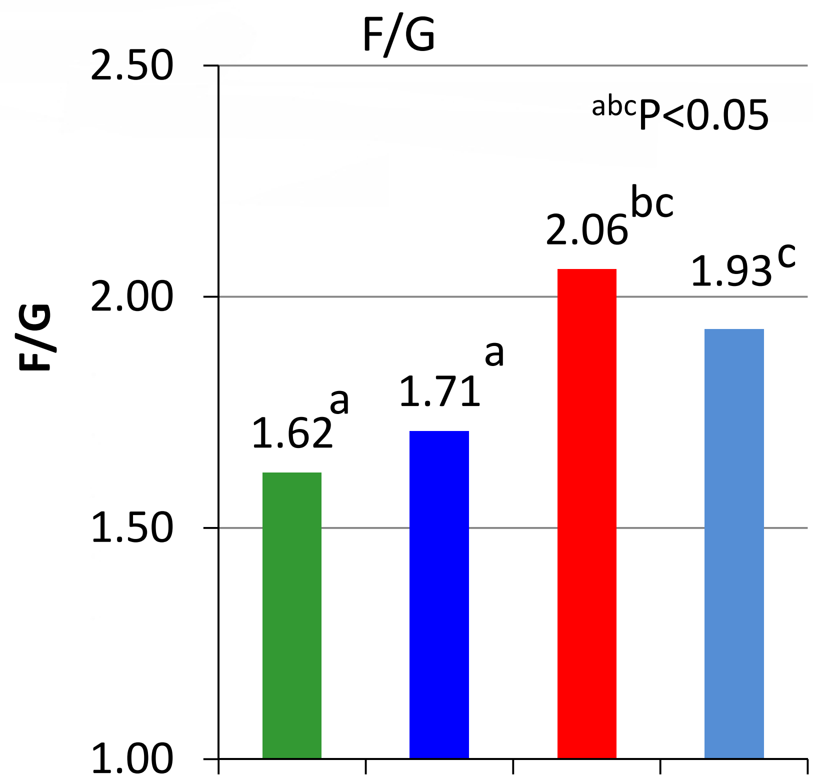
Effect of Lysine and Trp on Performance
21 d trial – 48 to 81 lb BW



CP, %	23.2	20.2	17.6	17.6
SID Lys	1.09	1.09	0.92	0.92
Trp:lys	20	20	14.5	20

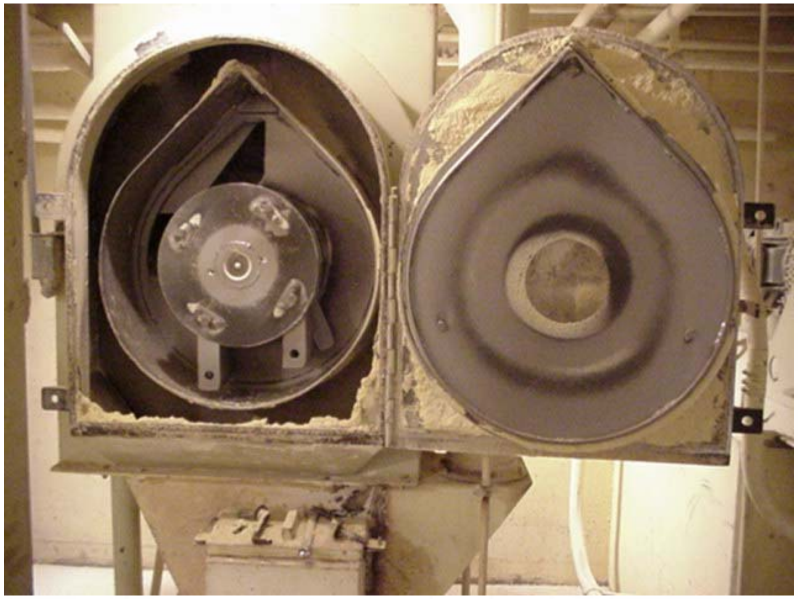


CP, %	23.2	20.2	17.6	17.6
SID Lys	1.09	1.09	0.92	0.92
Trp:lys	20	20	14.5	20

Goncalves et al, 2014

KSU Swine Day 2013

Knowledge *for* Life



Processing and complete diet grinding for high byproduct diets

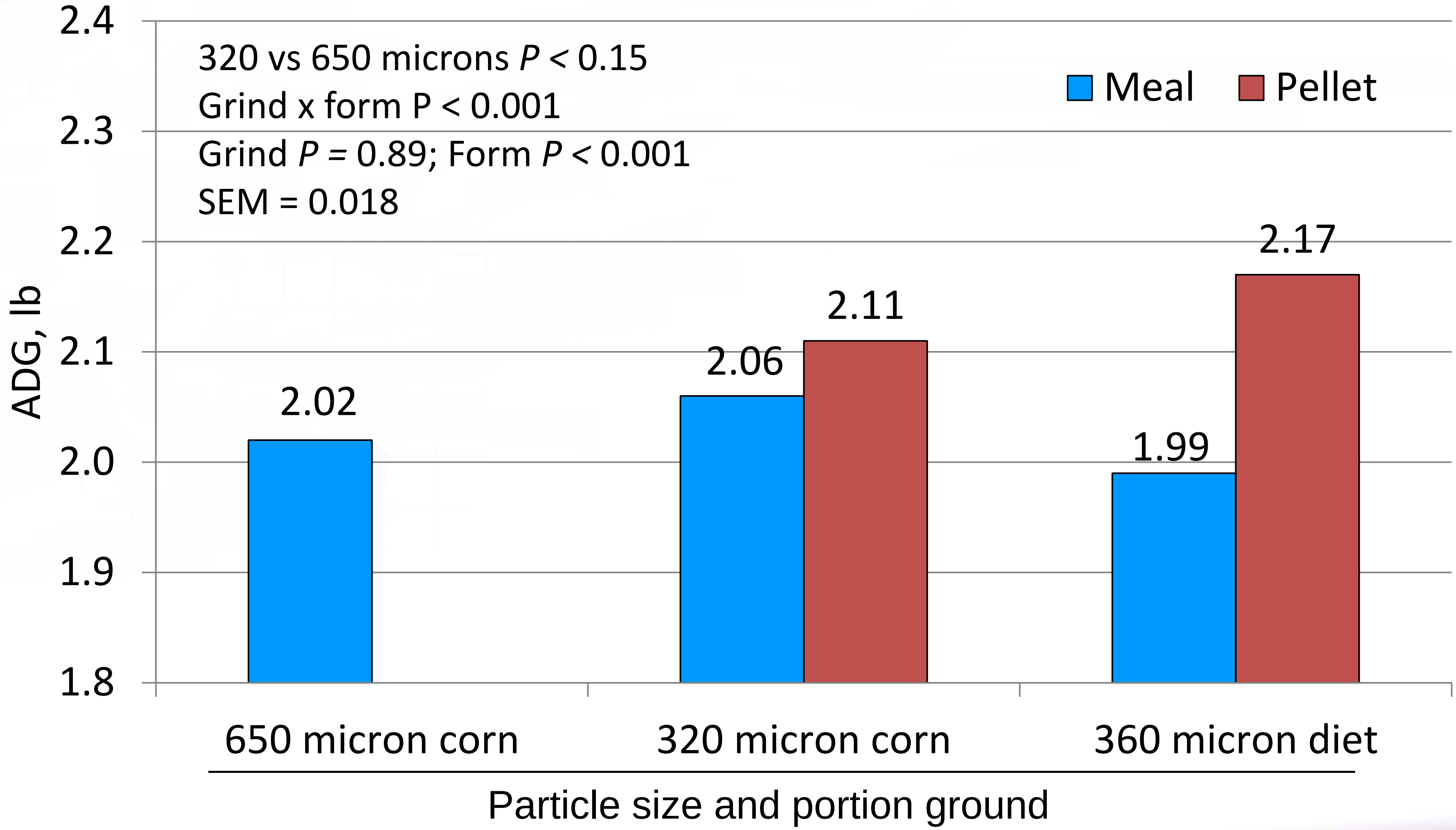
Kansas State University

www.KSUswine.org

Background

- Series of experiments partially supported by the National Pork Board and USDA-AFRI
  - Particle size and pelleting of high byproduct diets
    - Grow-finish pigs
    - Nursery pigs

Effect of particle size and diet form on finishing pig performance (d 0 to 111; BW 57 to 288 lb)



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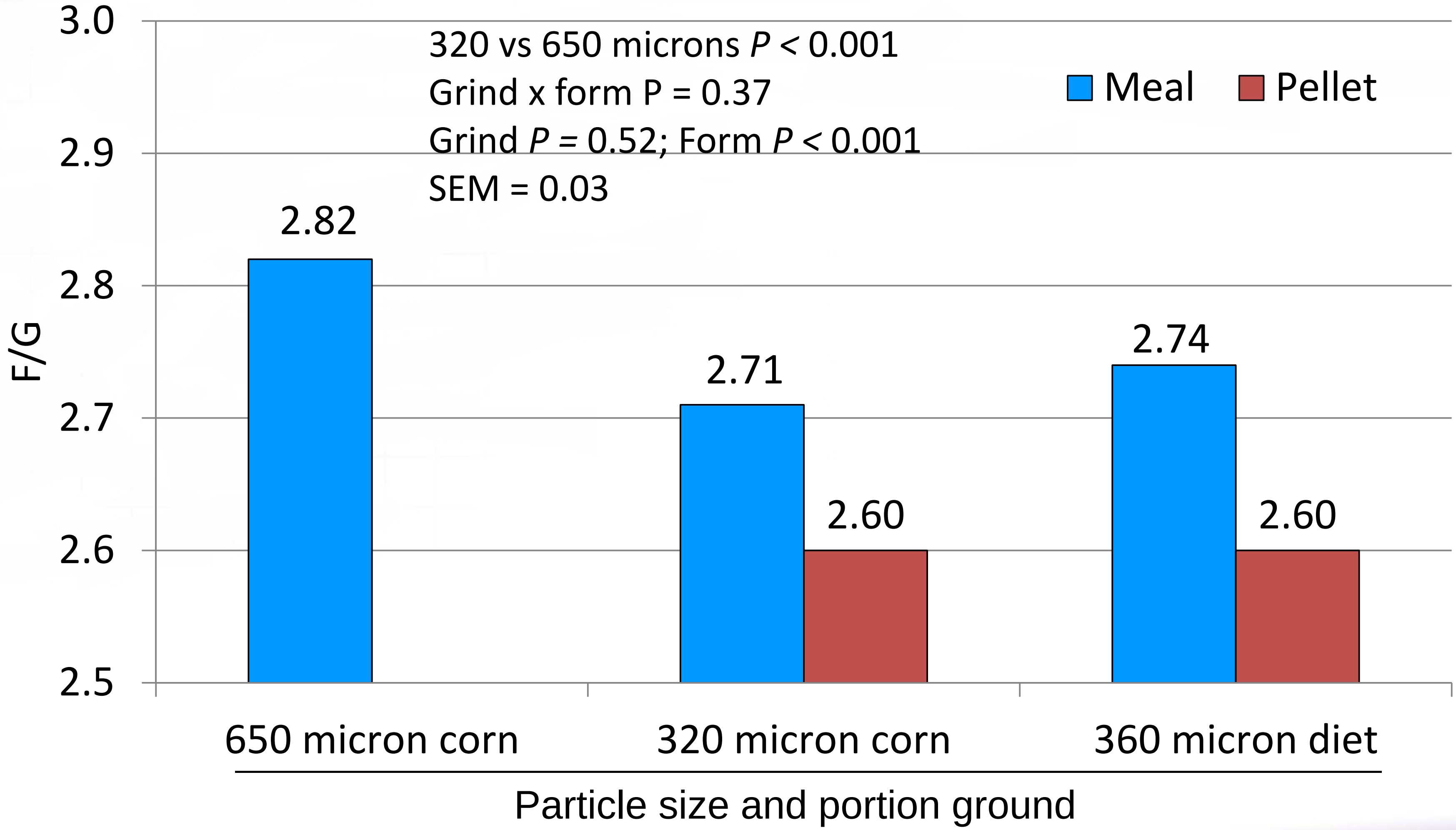
NFP NEW FASHION PORK

De Jong et al., 2012

Knowledge for Life

Effect of particle size and diet form on finishing pig performance (d 0 to 111; BW 57 to 288 lb)



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NFP NEW FASHION PORK

De Jong et al., 2012

Knowledge for Life

Project 2: Effect of particle size and diet form for nursery pigs

- Two diet types (meal vs pellet)
- Three processing treatments
  - Corn ground to 747 microns (650 micron diet)
  - Corn ground to 324 microns (425 micron diet)
  - Complete diet ground to 541 microns
- 996 pigs
- 6 pens per treatment

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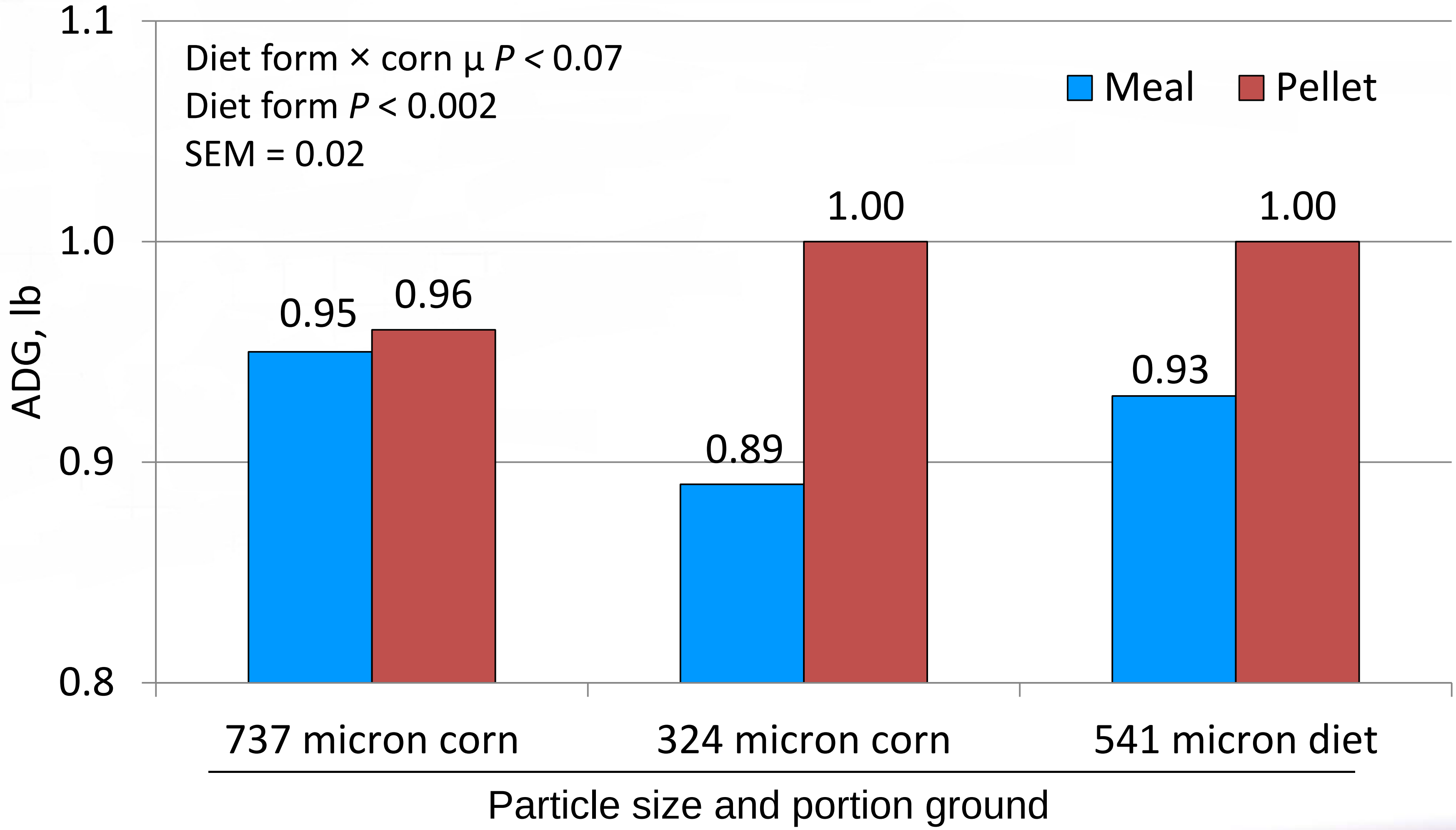
Hubbard Feeds Inc.

USDA United States Department of Agriculture

National Institute of Food and Agriculture

Effect of particle size and diet form on nursery pig performance (d 0 to 21; BW 24.5 to 45 lb)



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De Jong et al., 2013

USDA United States Department of Agriculture

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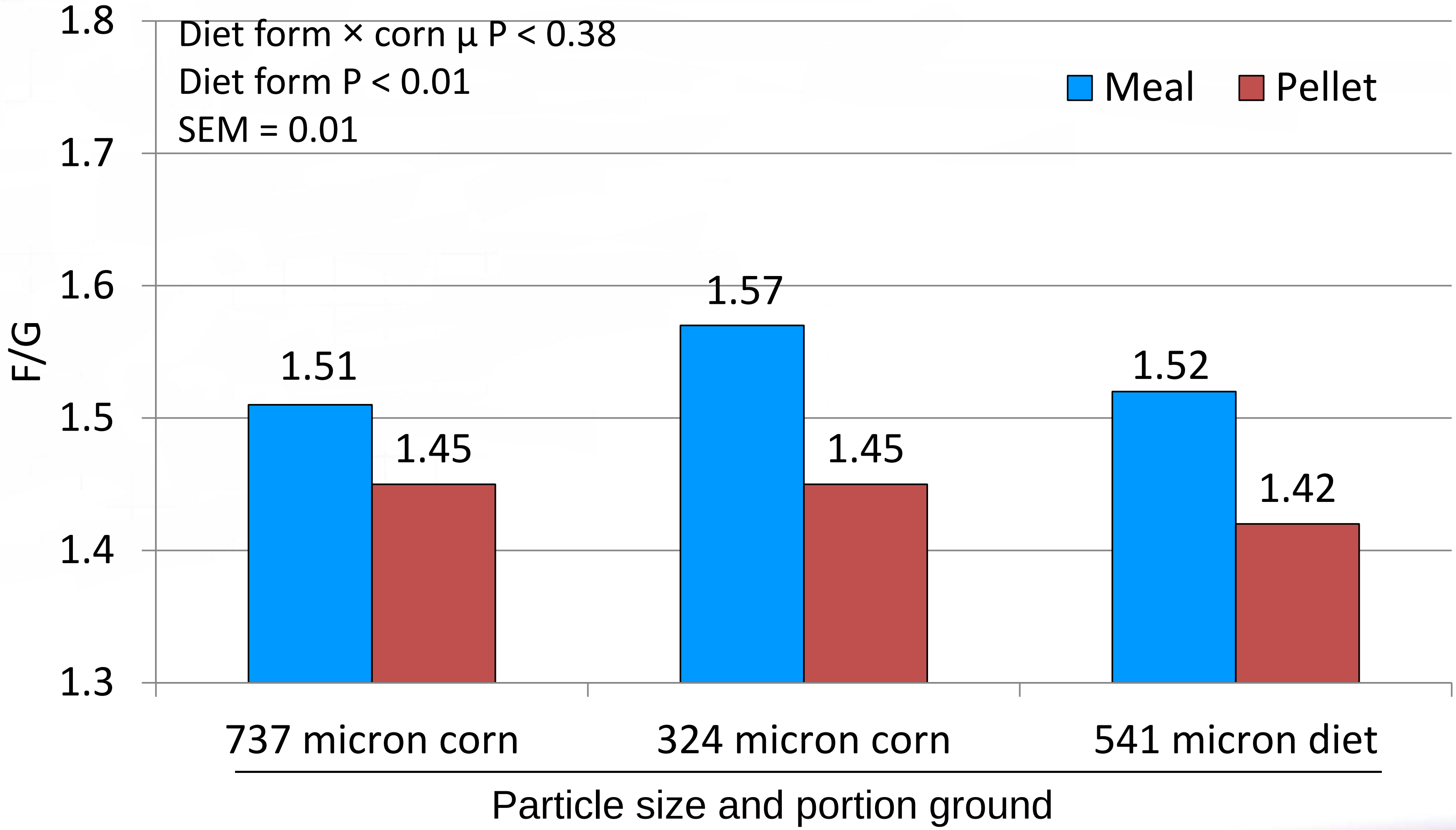
Effect of particle size and diet form on nursery pig performance (d 0 to 21; BW 24.5 to 45 lb)



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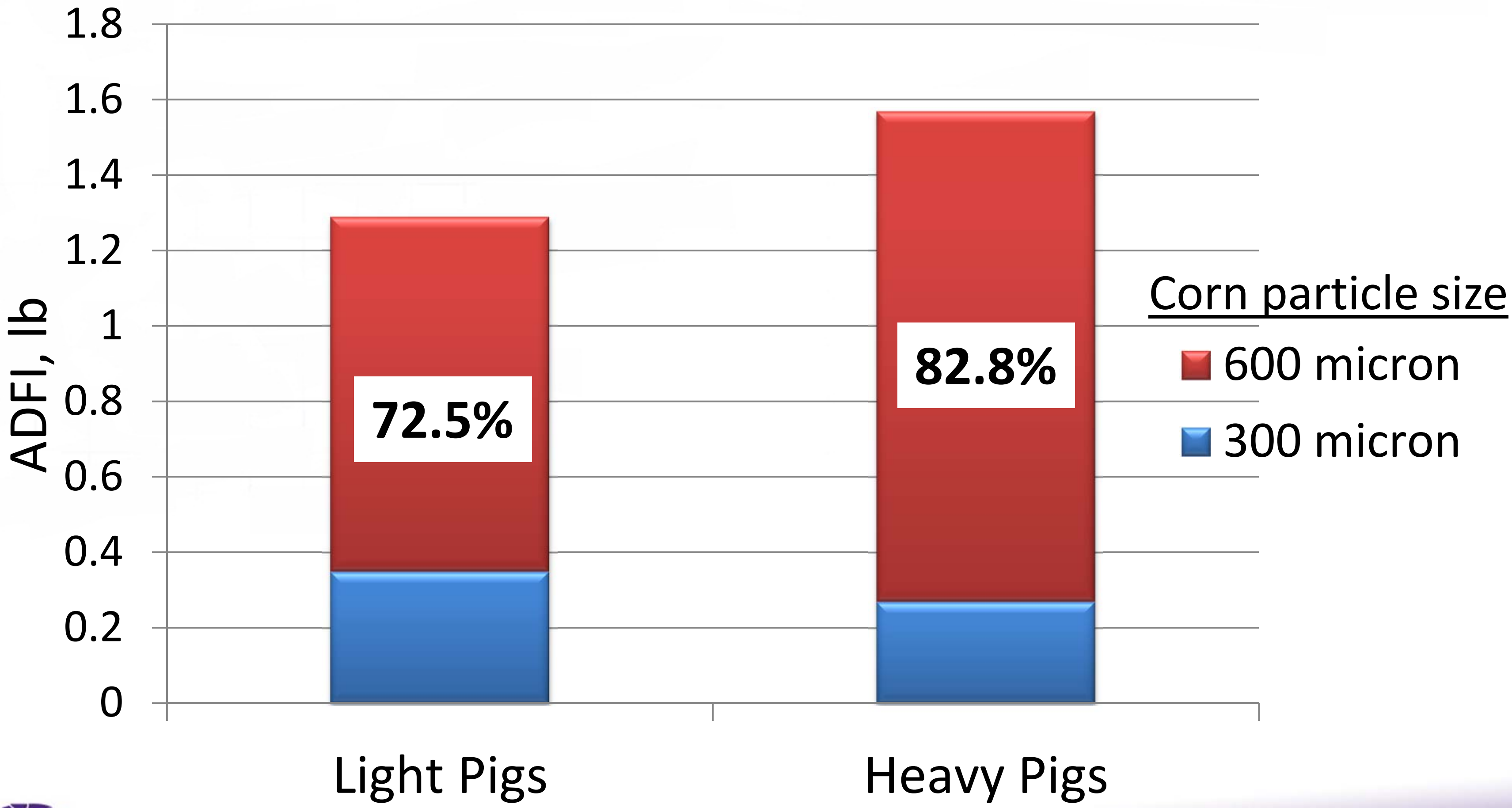
Hubbard Feeds Inc.

De Jong et al., 2013

USDA United States Department of Agriculture

National Institute of Food and Agriculture

Corn particle size affects feed intake preference of nursery pigs fed meal diets



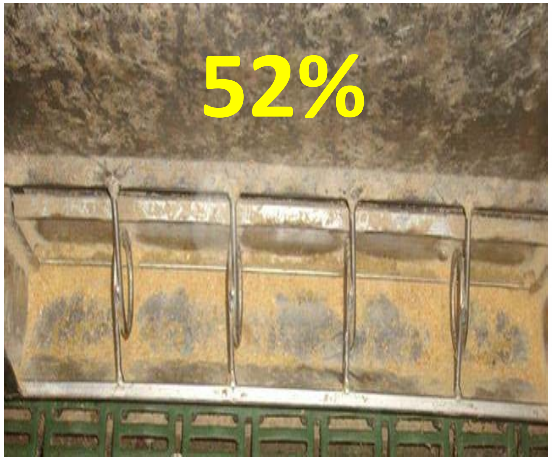
De Jong et al., 2014

Project 3: Effect of pellet quality and feeder adjustment on performance of nursery pigs

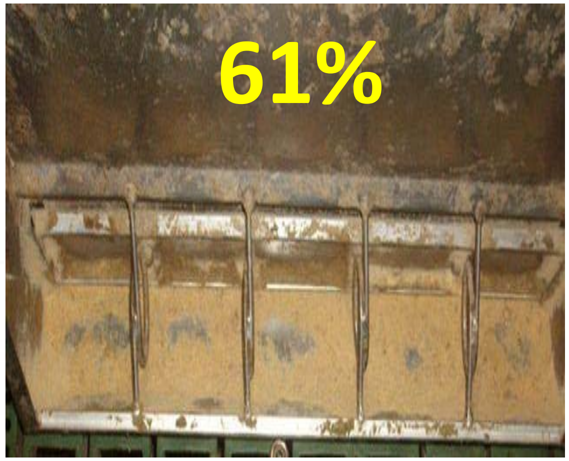
- Two experiments (210 and 1,005 pigs)
- Three diet types
  - Meal
  - Pellets (screened with < 5% fines)
  - Poor quality pellets (30% fines
- Two feeder adjustments
  - 0.5 inch (approximately 40 to 60% pan coverage)
  - 1 inch (92 to 99% pan coverage)
- 5 or 7 pens per treatment
- Diets with 20% DDGS

Field Trial Pan Coverage

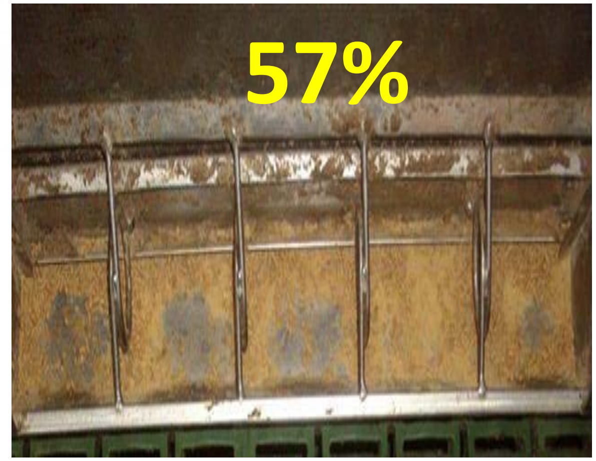
Narrow adjustment with meal diet



Narrow adjustment with poor pellets



Narrow adjustment with good pellets

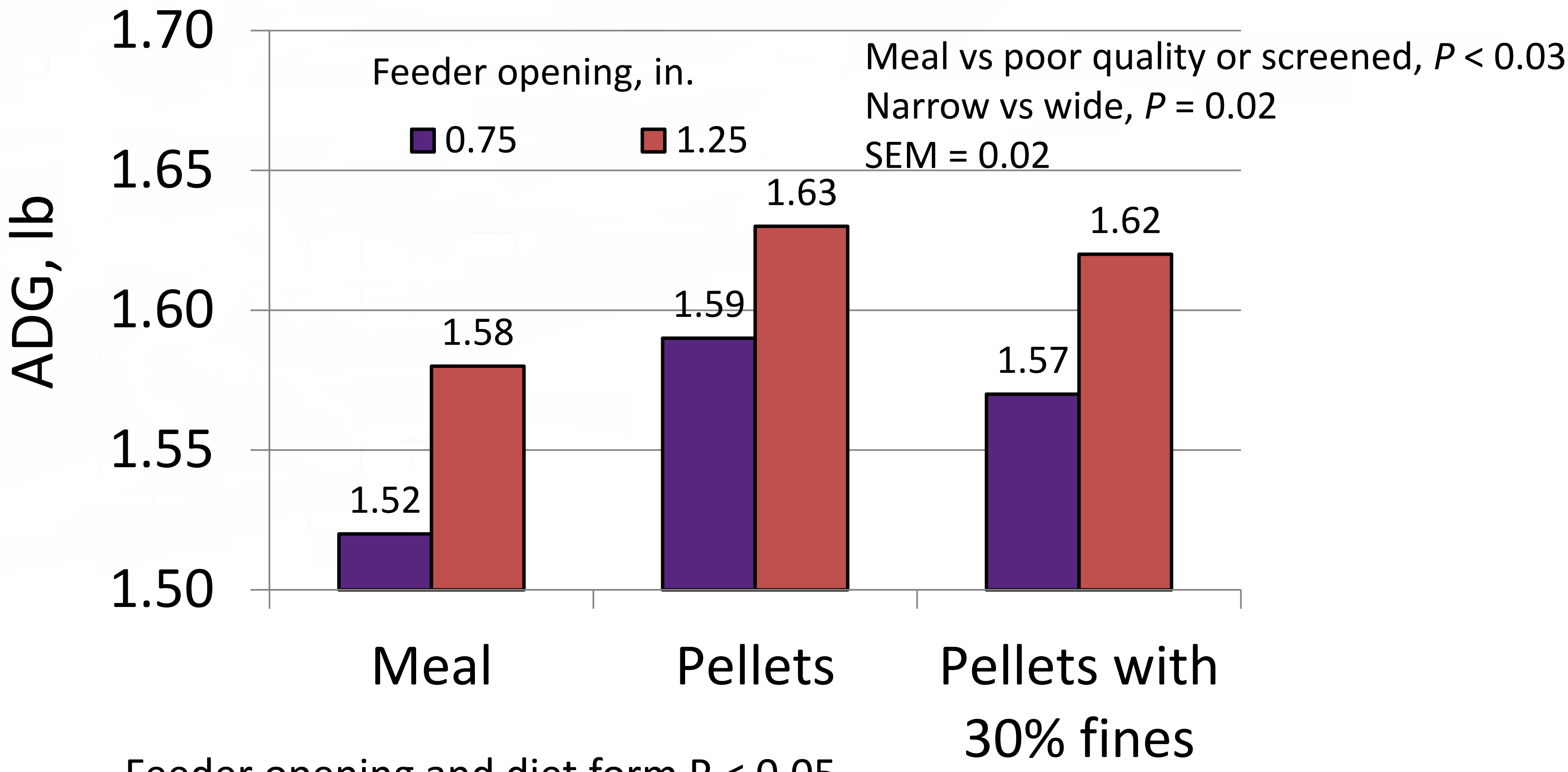


Wide adjustment with meal diet

Wide adjustment with poor pellets

Wide adjustment with good pellets

Effects of feeder adjustment and pellet quality on nursery ADG



Feeder opening and diet form P < 0.05

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HUBBARD

Nemechek et al. 2012

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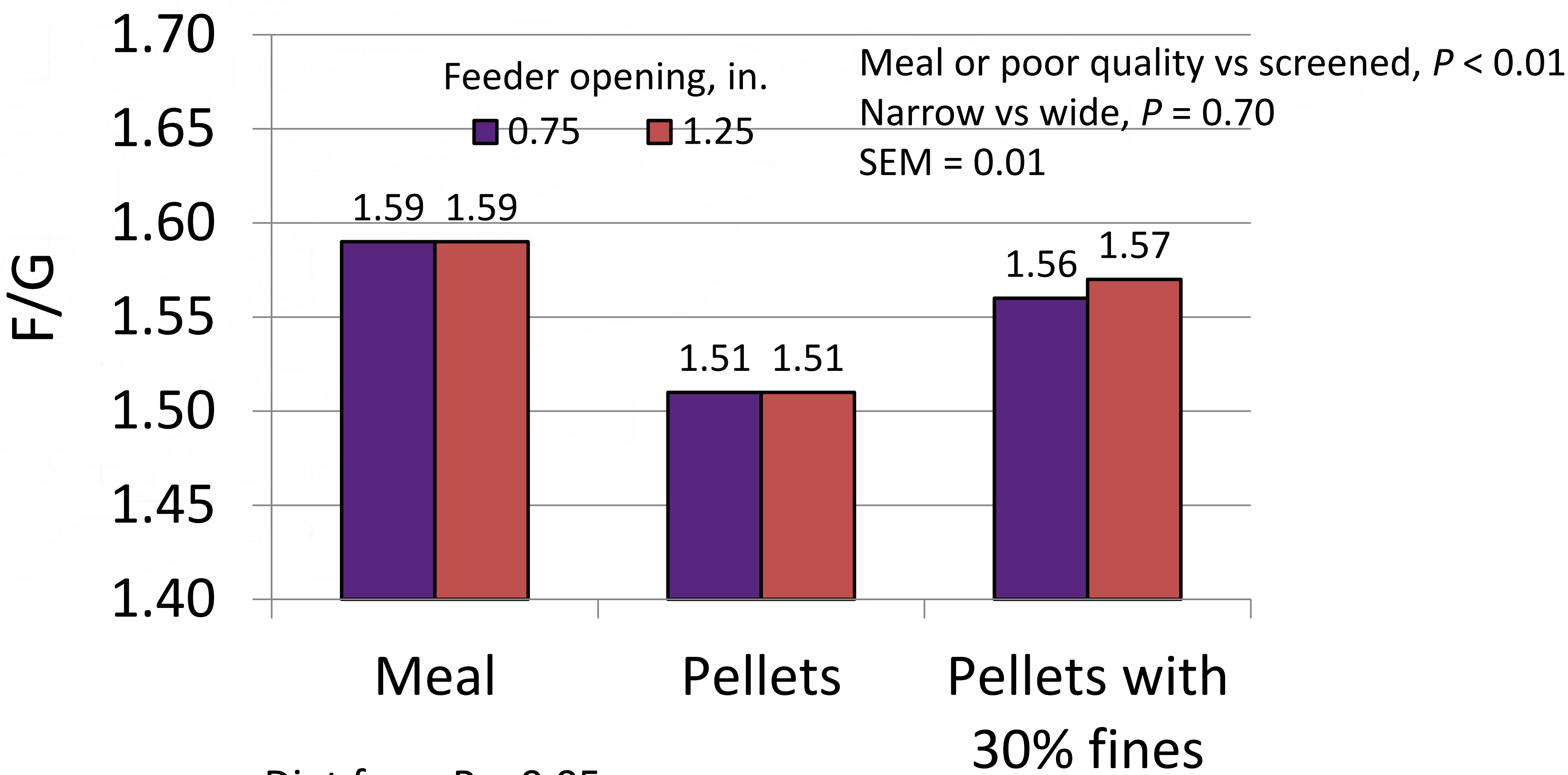
Effects of feeder adjustment and pellet quality on nursery F/G



Diet form P < 0.05

Nemechek et al. 2012

Knowledge for Life

Project 4: Effect of pellet quality and feeder adjustment on performance of finisher pigs

- Three diet types
  - Meal
  - Pellets (screened with < 10% fines)
  - Poor quality pellets (50% fines
- Two feeder adjustments
  - 0.5 inch (Pan coverage was 30 to 50% in P 1; 90% in P 3)
  - 1 inch (Pan coverage was 83 to 96% in P 1; 95% in P 3)
- 6 pens per treatment
- Diets with 20% DDGS until 200 lb, then 10% DDGS

Pan Coverage – Meal Diets

Narrow adjustment with meal diet

Phase 1, averaged 31% coverage

Phase 3, averaged 89% coverage

Wide adjustment with meal diet

Phase 1, averaged 83% coverage

Phase 3, averaged 95% coverage

Pan Coverage – Screened Pellets

Narrow adjustment with screened pellets

Phase 1, averaged 44% coverage

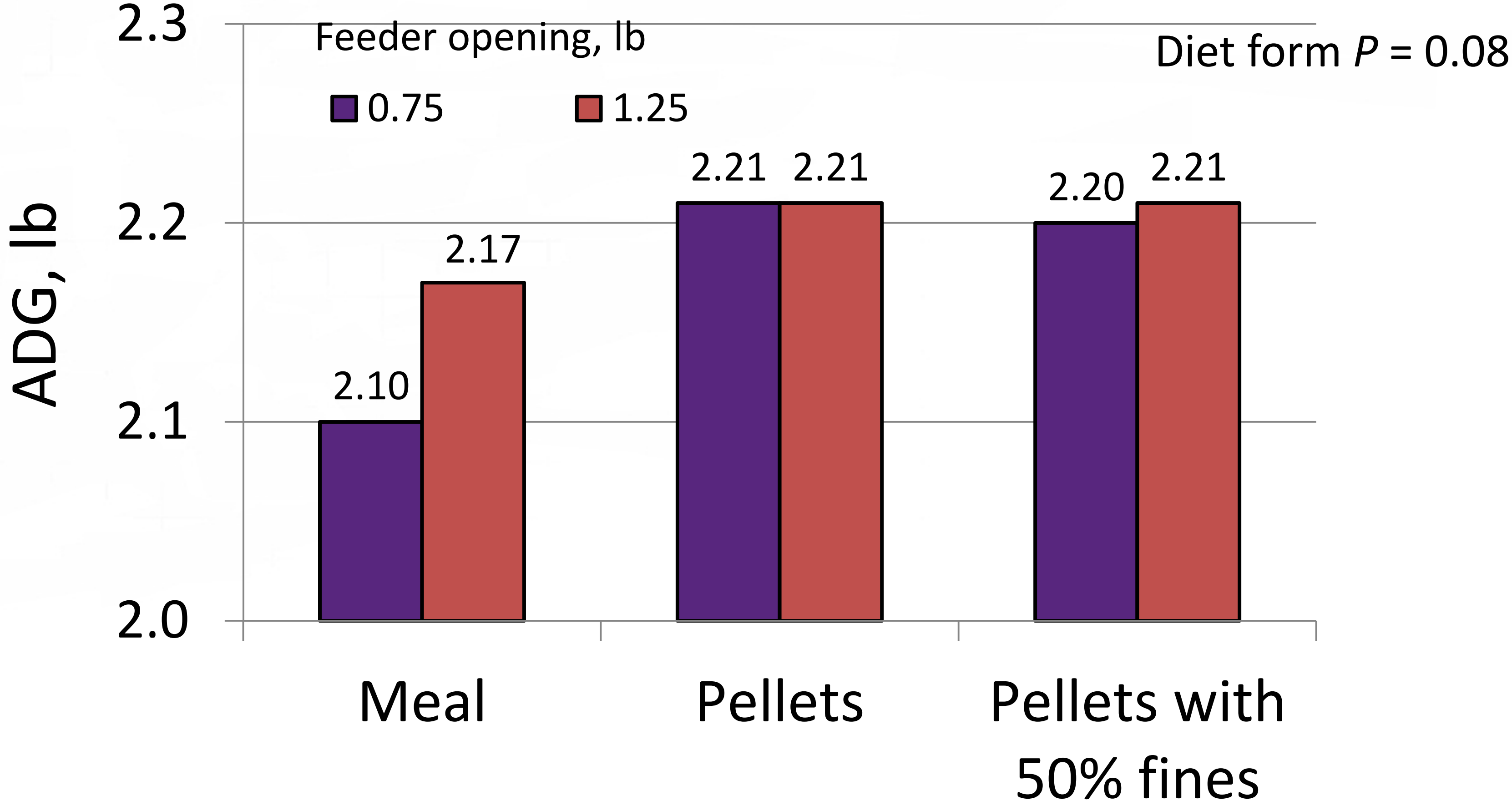
Phase 3, averaged 92% coverage

Wide adjustment with screened pellets

Phase 1, averaged 86% coverage

Phase 3, averaged 96% coverage

Effects of feeder adjustment and pellet quality on finisher ADG



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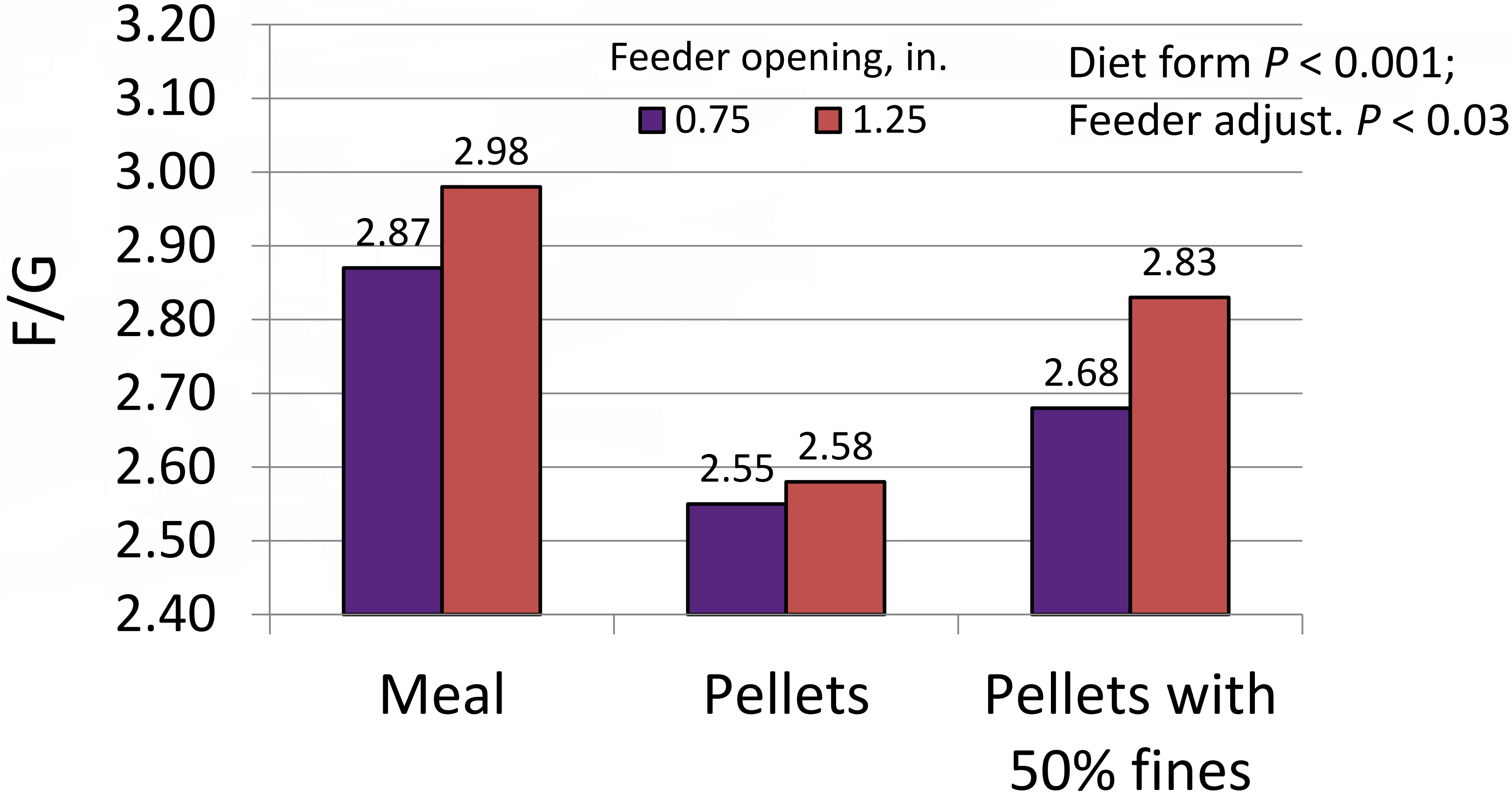
Hubbard Feeds Inc.

Nemechek et al. 2012

Knowledge for Life

Effects of feeder adjustment and pellet quality on F/G

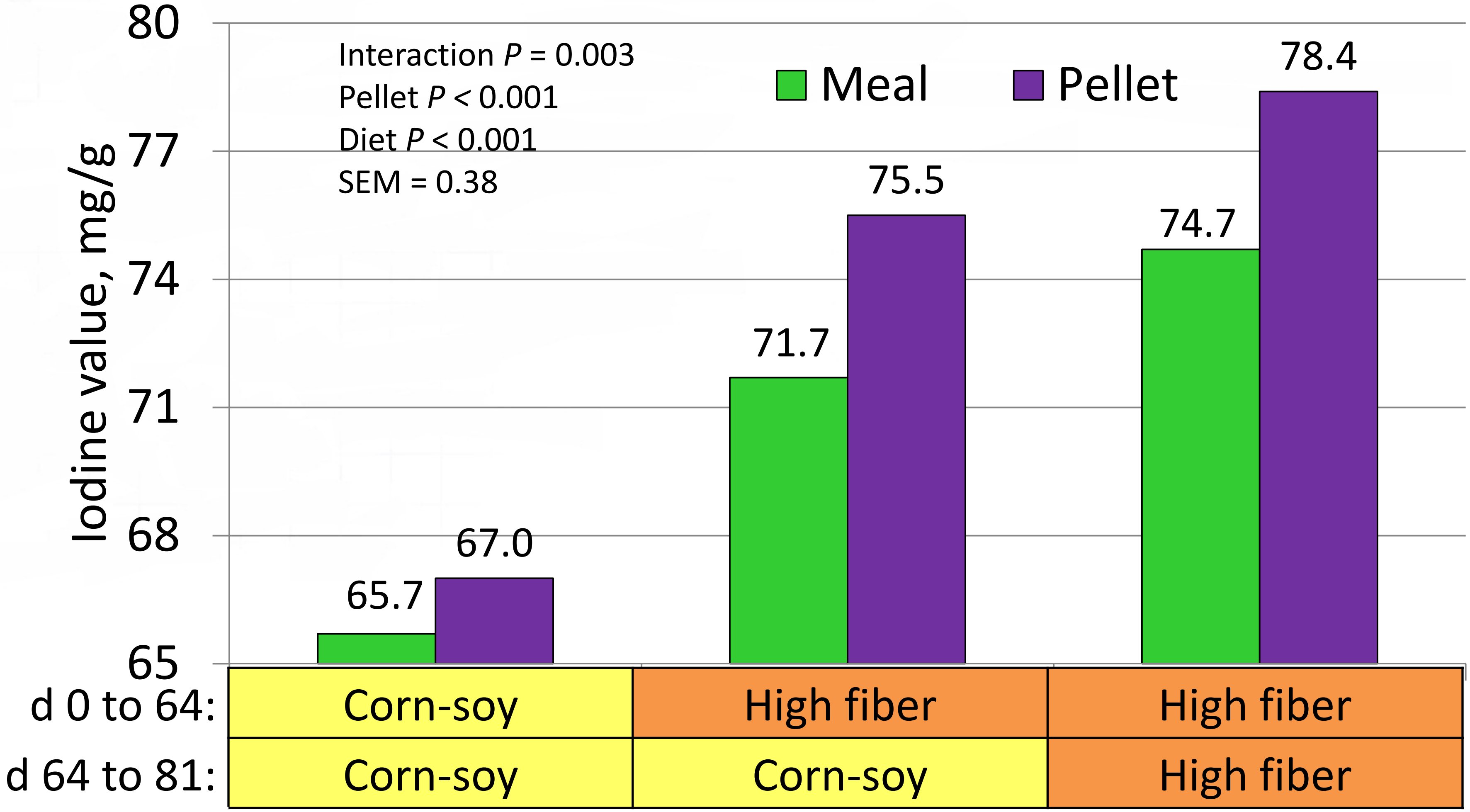


Nemechek et al. 2012

Project 5: Effect of high byproducts and diet form on growth performance of finishing pigs.

- Two diet types
  - Meal
  - Pellets (screened with < 10% fines)
- Three diet regimens
  - Corn-soybean meal diets
  - High fiber diets (30% DDGS and 19% wheat midds)
  - High fiber diets to 245 lb, then corn-soy for 17 days
- 6 pens per treatment
- University research facility

Effect of fiber level and diet form on finishing pig belly fat iodine value (d 81; BW 287 lb)

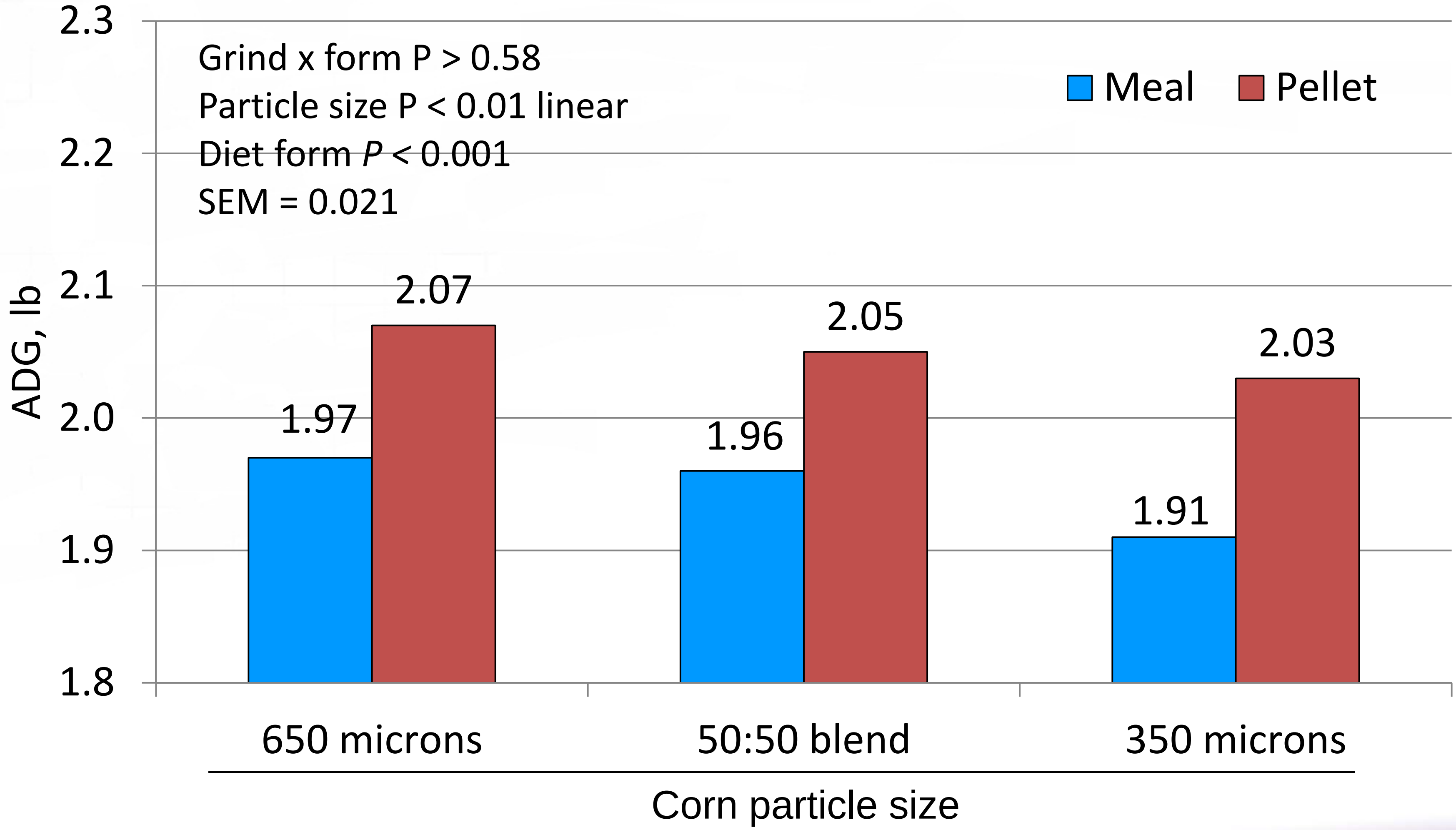


Nemechek et al., 2012

Project 6: Effect of particle size and diet form for finishing pigs

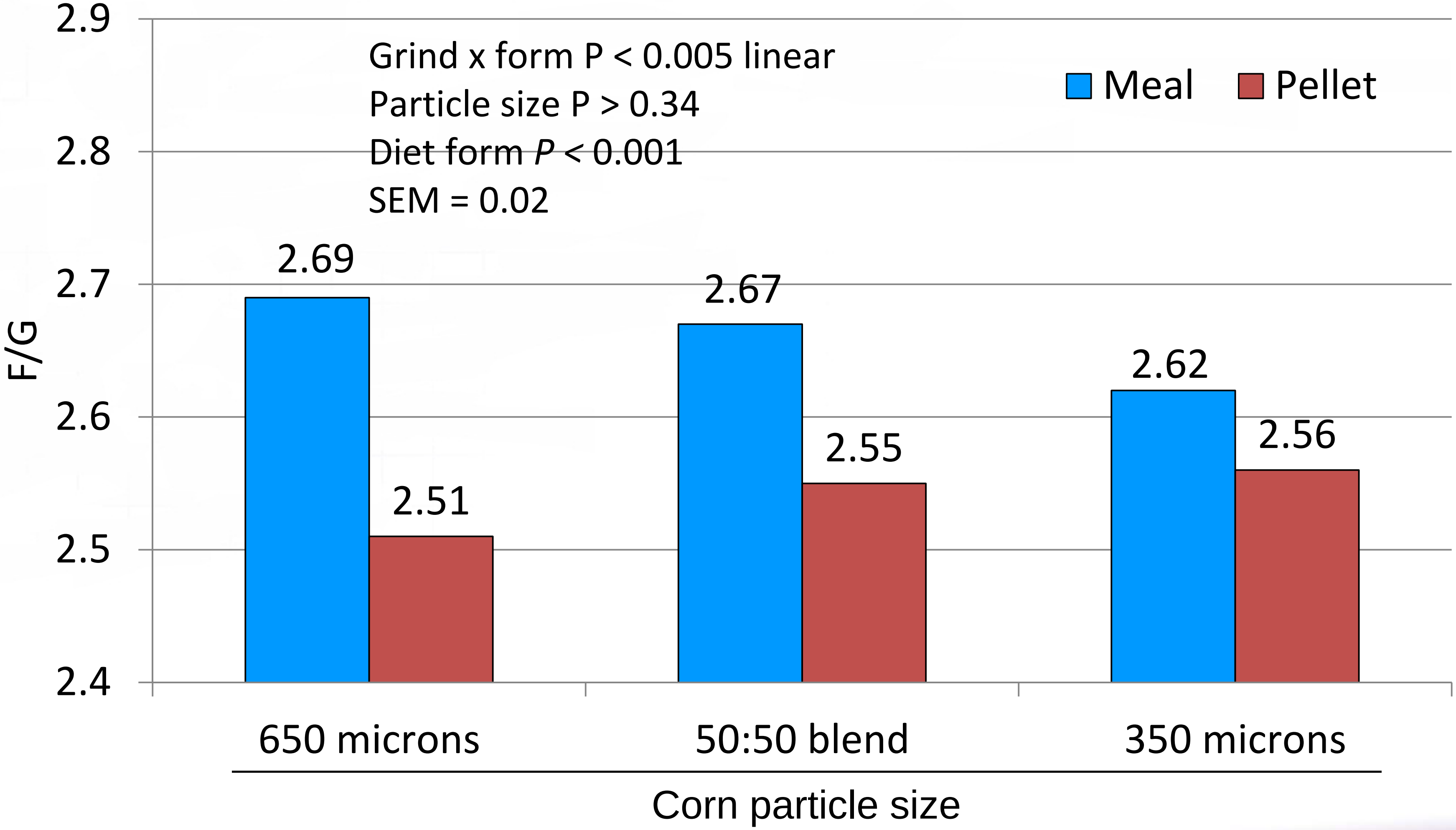
- Two diet types (meal vs pellet)
- Three corn particle sizes
  - Roller mill at 650 microns
  - Hammer mill at 350 microns
  - Blend of roller and hammer mill (500 microns)
- 960 pigs
- 8 pens per treatment

Effect of particle size and diet form on finishing pig performance (d 0 to 101; BW 76 to 275 lb)



Nemechek et al., 2013

Effect of particle size and diet form on finishing pig performance (d 0 to 111; BW 57 to 288 lb)



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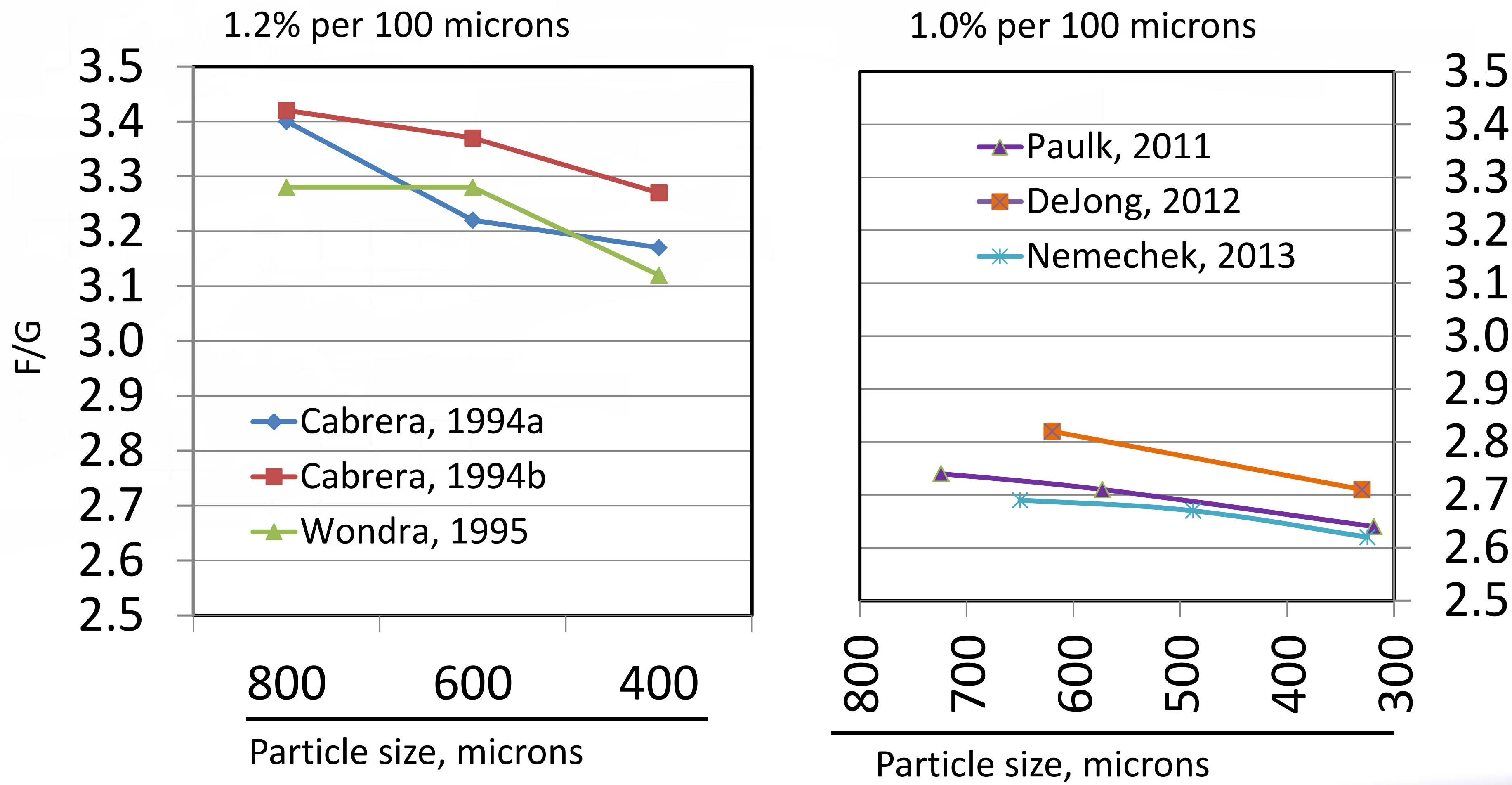
Nemechek et al., 2013

USDA United States Department of Agriculture

National Institute of Food and Agriculture

Effects of particle size in meal diets on feed efficiency of finishing pigs



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Conclusions – Particle size

- Reducing particle size of grain improves F/G
  - For grow-finish pigs
    - Benefit is linear to at least 300 microns in meal diets
    - Does not appear to be as beneficial to grind below 600 microns in high quality pellets (more research may be needed to validate)
  - For nursery pigs:
    - No benefit in F/G to grind corn below 600 microns
- Feed intake and gain are reduced when corn is ground to 300 microns in meal diets for nursery or finisher pigs

Pelleting on growth performance of grow-finish pigs 2005 to 2013

Reference	Meal			Pellet	
	ADG	F/G		ADG	F/G
Groesbeck et al. (2005)	0.83	1.25		0.90	1.22
Groesbeck et al. (2005)	0.62	1.43		0.65	1.37
Groesbeck et al.(2006)	0.80	1.25		0.78	1.17
Potter et al. (2009)	1.95	2.12		2.05	2.07
Potter et al. (2009)	1.92	2.83		2.04	2.68
Myers et al. (2010)	1.81	2.76		1.94	2.82
Potter et al. (2010)	1.92	2.86		2.03	2.70
Frobose et al. (2011)	1.46	1.72		1.43	1.63
Frobose et al. (2011)	1.29	1.51		1.38	1.40
Myers et al. (2011)	1.96	2.73		1.97	2.67
Paulk et al. (2011)	2.50	2.75		2.63	2.55
Paulk et al. (2011)	2.31	2.50		2.44	2.40
Nemecheck et al. (2012)	2.10	2.83		2.17	2.67
Nemecheck et al. (2012)	2.14	2.93		2.21	2.57
De Jong et al. (2012)	2.03	2.73		2.14	2.6
Nemechek et al. (2013)	1.95	2.66		2.05	2.54
Average	**1.72**	**2.30**		**1.80**	**2.19**

Average response = 4.4% for ADG and 5.1% for F/G

Conclusions - Pelleting

- Pelleting
  - Improves ADG and F/G
  - Response depends on particle size
    - Greater F/G response at higher particle sizes
  - Response depends on diet formulation
    - Greater response in higher byproduct diets
  - Response depends on pellet quality
    - Linear response to improving pellet quality
  - Negatively impacts fat firmness (increased iodine value)
  - Economic analysis must include the potential increase in mortality with pellets

Conclusions – Complete diet grinding

- Complete diet grinding
  - Does not appear to improve performance in high fiber diets that we have tested (DDGS, wheat middlings)
  - No performance benefit found to grinding other ingredients
    - DDGS (may depend on initial particle size)
    - Wheat middlings
    - Soybean hulls
    - Soybean meal
  - Reduces intake in meal diets
  - Must gain enough benefit in pellet quality to justify cost

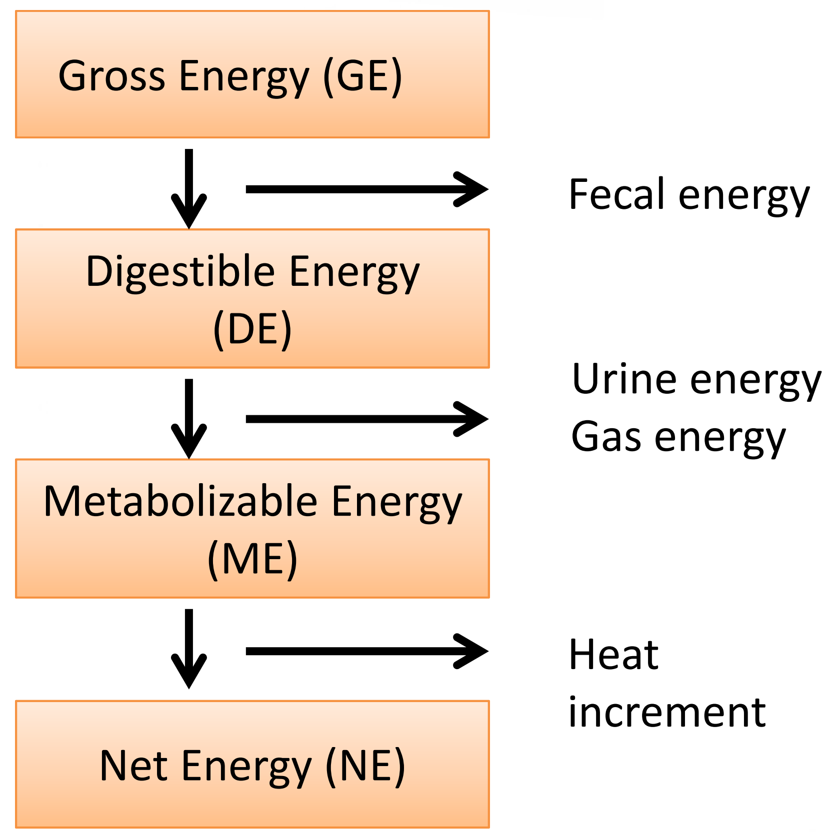
Feed efficiency Factsheets

- Swine Feed Efficiency, IPIC 25a: Not Always Linked to Net Income
- Swine Feed Efficiency, IPIC 25b: Genetic Impact
- Swine Feed Efficiency, IPIC 25c: Particle Size Testing Methodology
- Swine Feed Efficiency, IPIC 25d: Influence of Particle Size
- Swine Feed Efficiency, IPIC 25e: Influence of Pelleting
- Swine Feed Efficiency, IPIC 25f: Influence of Temperature
- Swine Feed Efficiency, IPIC 25g: Decision Tree
- Swine Feed Efficiency, IPIC25h: Influence of Market Weight
- Swine Feed Efficiency, IPIC 25i: Effect of Dietary Energy
- Swine Feed Efficiency, IPIC 25j: Influence of Ractopamine
- Swine Feed Efficiency, IPIC 25k: Feeder Design and Management
- Swine Feed Efficiency, IPIC 25l: Influence of Amino Acids
- Swine Feed Efficiency, IPIC 25m: Sow Feed on Whole Farm Efficiency

Net Energy

Regression Analysis to Predict Growth Performance from Dietary Net Energy in Growing-Finishing Pigs

- Low energy diets typically reduce feed cost but also lower growth performance
- Prediction of growth and feed efficiency is essential to quantify the feeding value dietary energy
- NE is the most accurate system to evaluate effect of energy on growth



Can NE predict growth responses?

- A literature search using CABI search engine including thesis, technical memos, and university publications from 1991 to 2012
- *Selection for inclusion and exclusion criteria*
  - Treatment diets vary in DE, ME, or NE
  - ≥ 4 replications/treatment
  - 41 trials from 17 journal articles, 10 technical memos, and a thesis resulting in 285 observations
- *Diet composition calculation*
  - Reformulated diets using a spreadsheet-based software program (Kansas State University Diet Formulation Program)
  - The NRC (2012) ingredient library was used as a reference for nutrient ingredients in diet reformulation

Nitikanchana et al., 2013

Net energy meta-analysis

- *Statistical analysis*
  - Diet Characteristics:

    NE, 1,980 to 2,815 kcal/kg

    Fat, 1.8 to 10% Ash, 3.1 to 6.7%

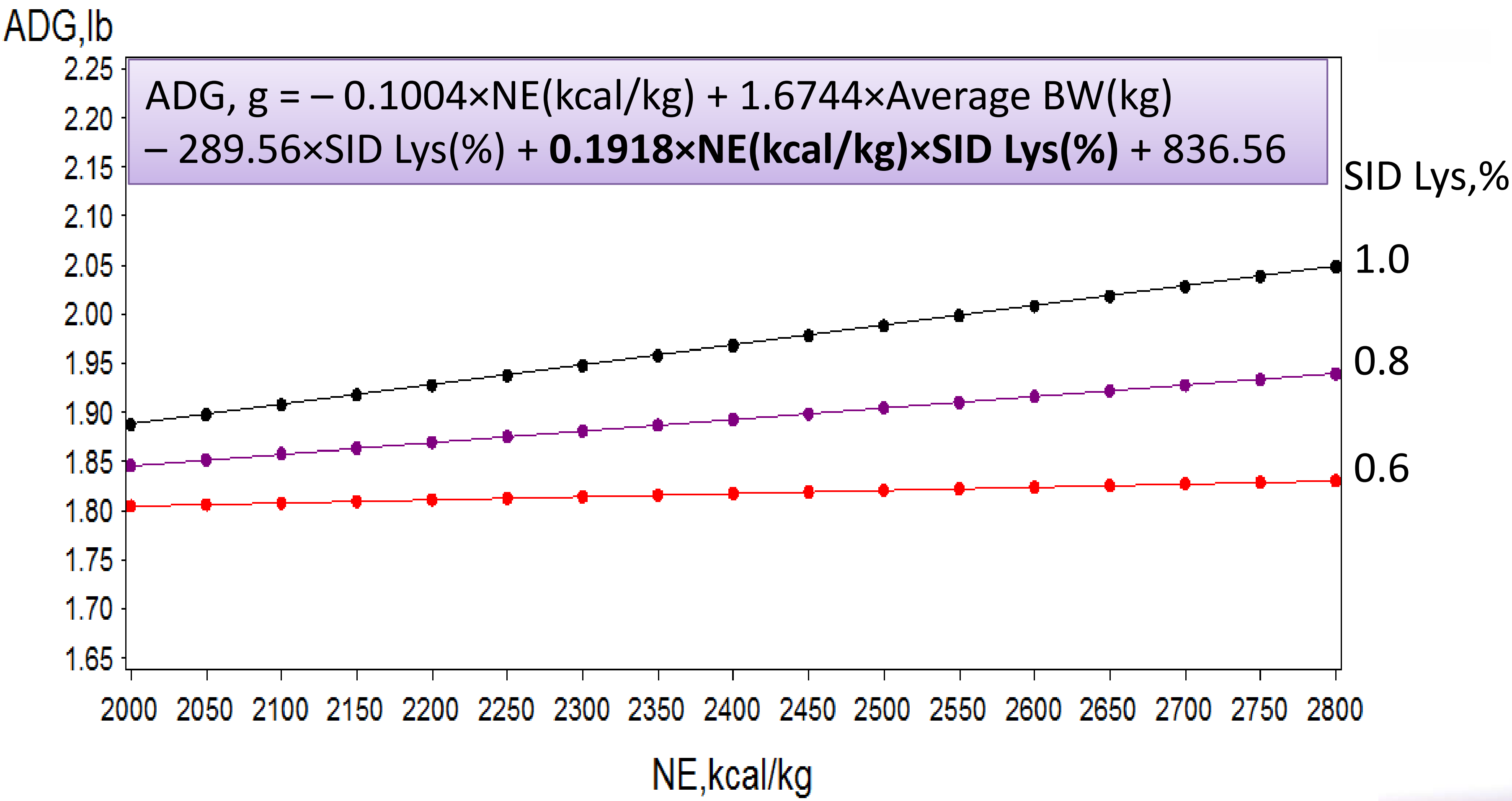
    CF, 1.9 to 12.5% NDF, 6.7 to 29.5% ADF, 2.5 to 14.9%

    CP, 8.9 to 22.9 SID Lys, 0.51 to 1.15%

  - Average BW, 73 to 280 lb
  - The PROC MIXED procedure of SAS with
    - Linear and quadratic terms of NE, average BW, CP, SID Lys, CF, NDF, ADF, fat, and ash, including their interaction terms evaluated as predictors of ADG and G:F
    - Experiment within trial was random effect

Nitikanchana et al., 2013

Predicted ADG of 167-lb pig fed increasing dietary NE at varying levels of SID Lys



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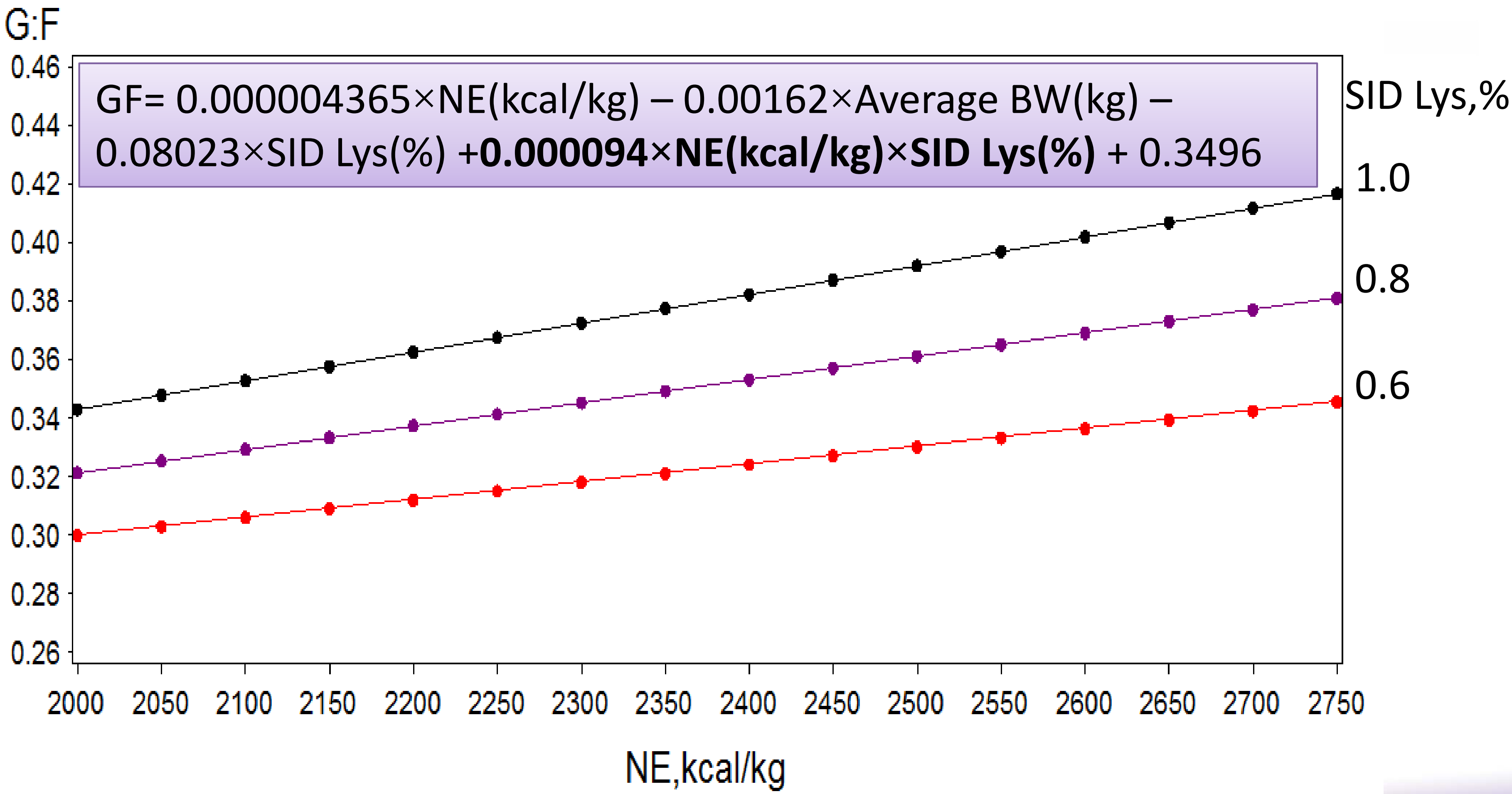
Nitikanchana et al., 2013

Knowledge for Life

Predicted G:F of 167 lb pig fed increasing dietary NE at varying levels of SID Lys



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Nitikanchana et al., 2013

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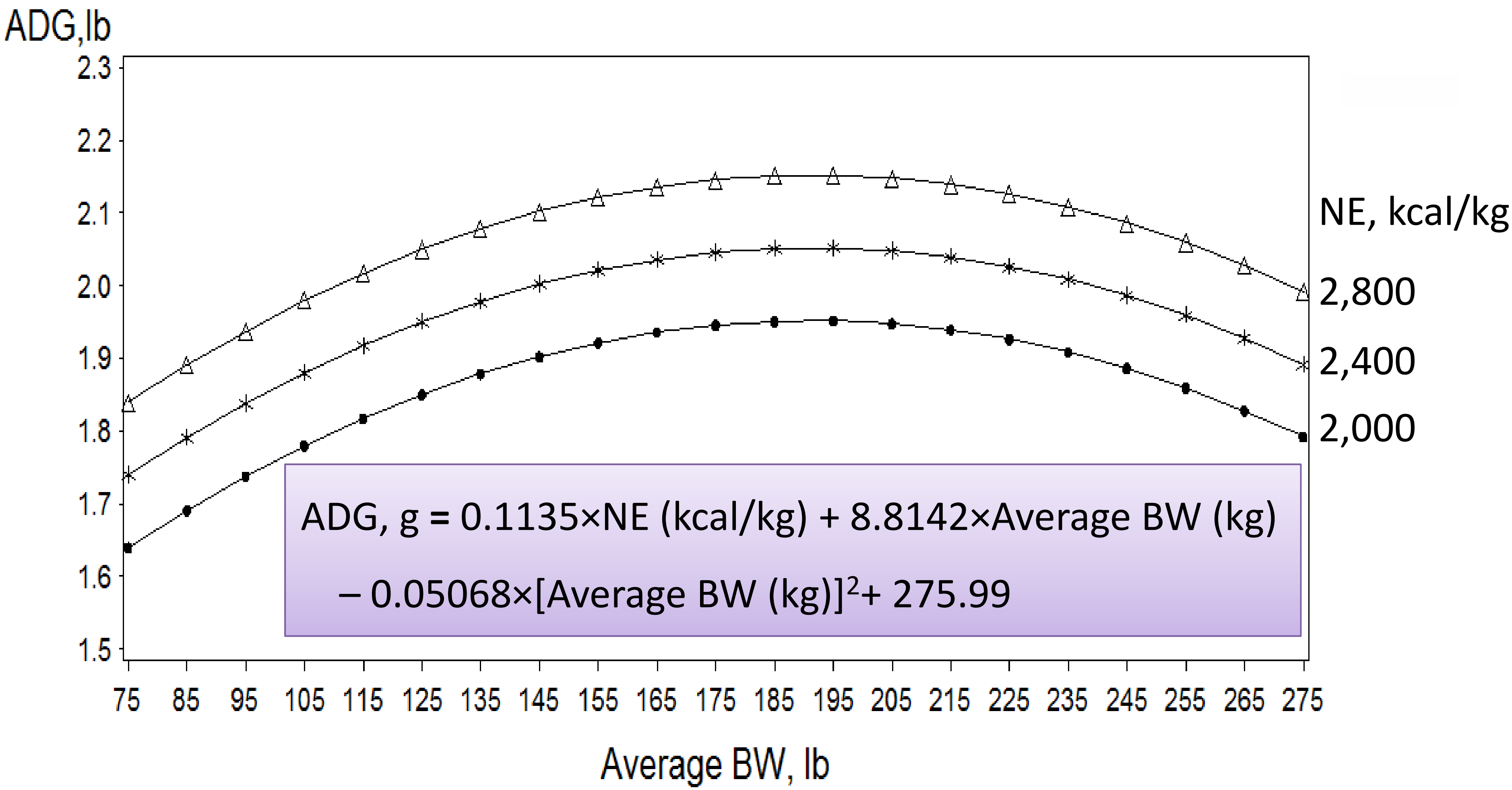
Predicted ADG of pigs fed varying Dietary NE



$$\text{ADG, g} = 0.1135 \times \text{NE (kcal/kg)} + 8.8142 \times \text{Average BW (kg)} - 0.05068 \times [\text{Average BW (kg)}]^2 + 275.99$$

Nitikanchana et al., 2013

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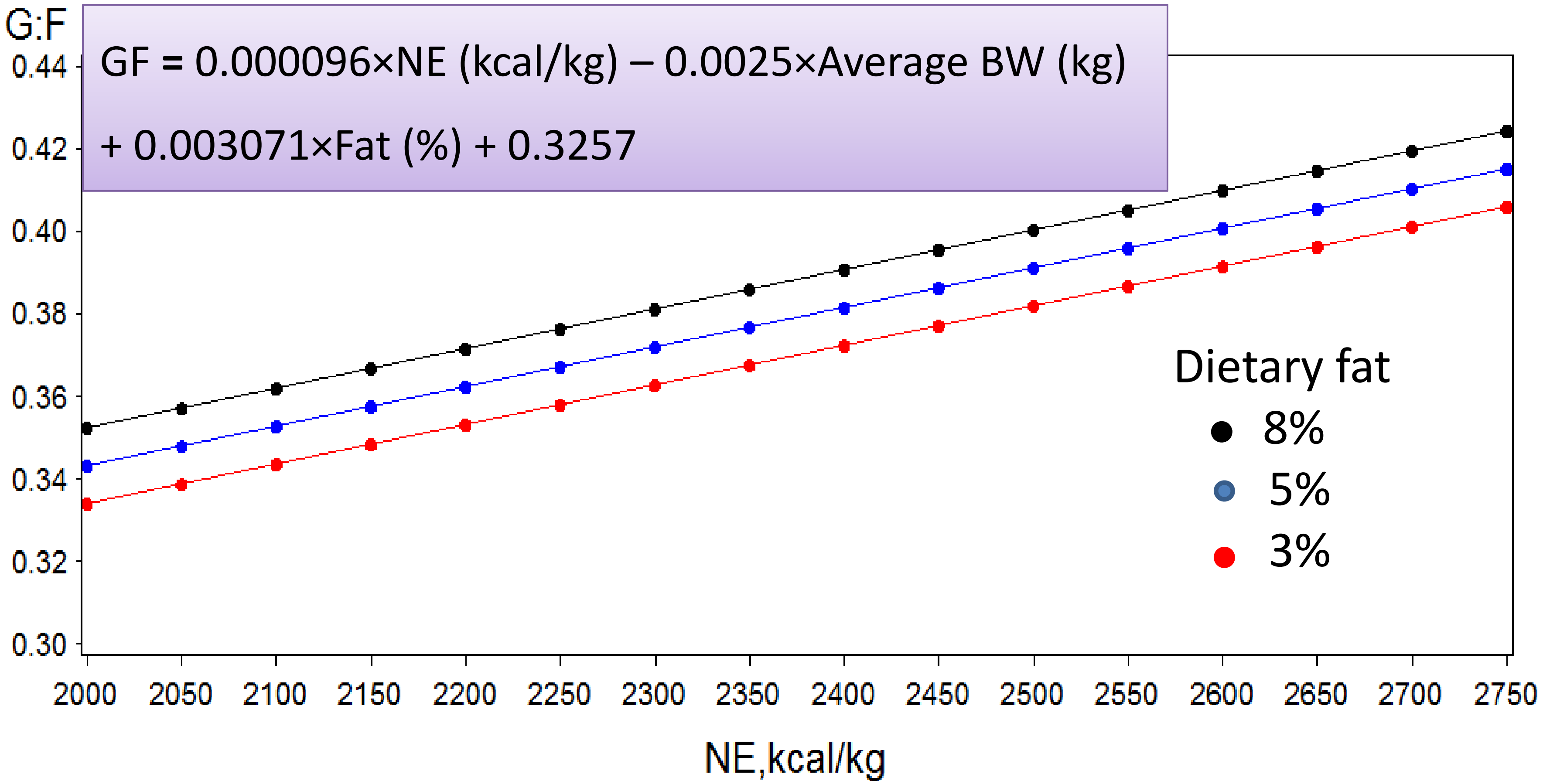
Predicted G:F of 167 lb pigs fed increasing dietary NE at varying dietary fat levels



Nitikanchana et al., 2013

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Conclusion

- Dietary NE is an important predictor of the growth performance of growing-finishing pigs.
- Improvements in growth rate and feed efficiency could be obtained by increasing dietary NE across a wide variety of trials with different dietary ingredients and under different environmental conditions.
- The magnitude of improvement in growth performances by dietary NE will be minimized if the amino acids are limiting.
- The improvement of G:F with fat in the model indicating that NE may underestimate the influence of fat on feed efficiency.

Nitikanchana et al., 2013

The Effect of Feeding Different Dietary Net Energy Levels to Growing-Finishing Pigs when Dietary Lysine is Above Requirements

- 2 experiments using 543 pigs (PIC 1050 x 327)
- The SID Lys was formulated at 105% requirement of the lightest BW pig fed high energy level in each feeding phase
- Dietary treatments included 3 dietary NE levels
  1) 30% DDGS + 20% midds + 4% Soybean hulls
  2) 20% midds + 5% Soybean hulls
  3) 20% midds + 5% Soybean hulls + 3.7% CWG
  4) Corn-SBM
  5) Corn-SBM+ 3.7% CWG

Low NE (1–2)

166 kcal/kg

Medium NE (3–4)

166 kcal/kg

High NE (5)

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Nitikanchana et al., 2014

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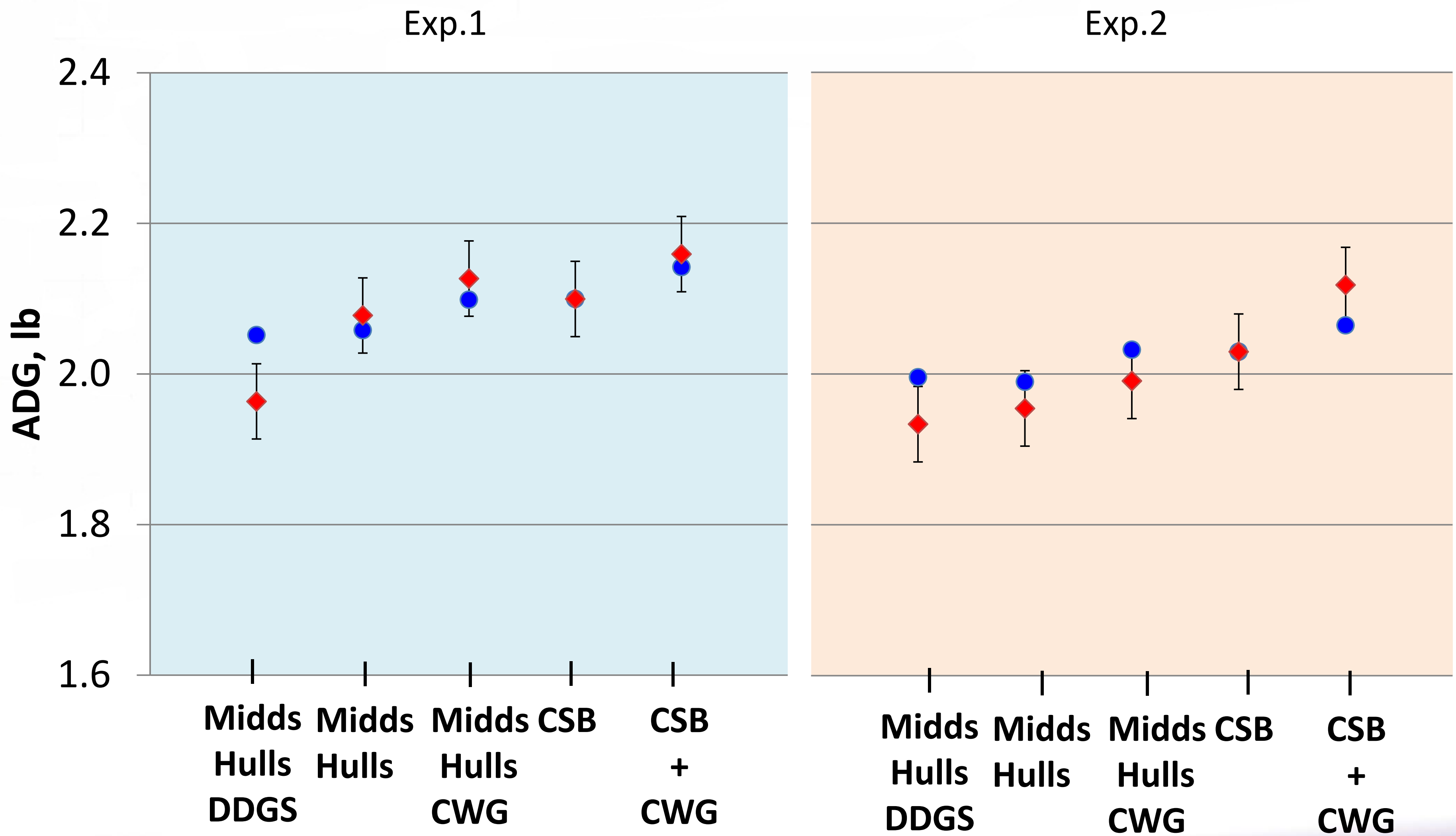
Results : Predicted ● vs. Actual ◆ ADG



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Nitikanchana et al., 2014

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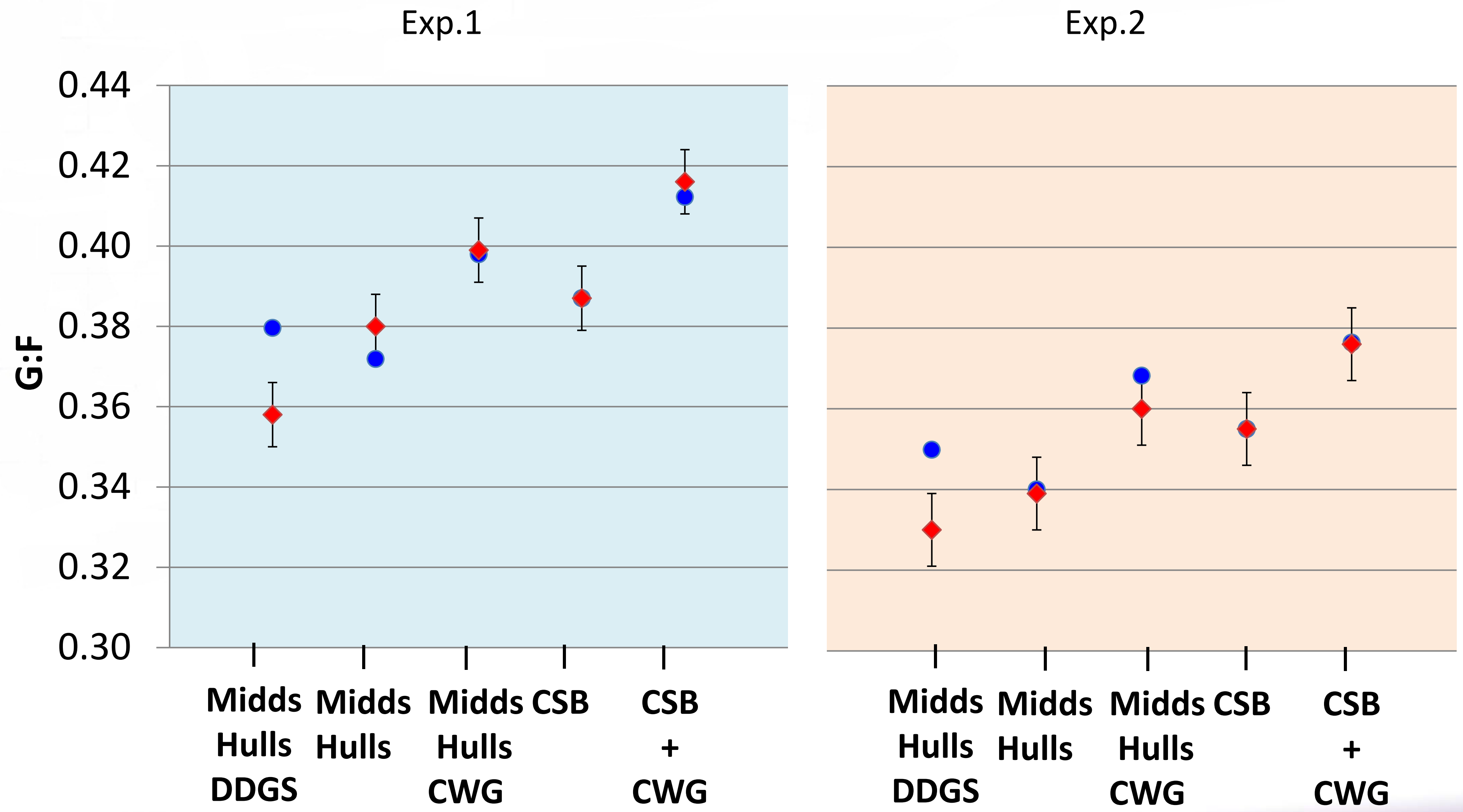
Results : Predicted ● vs. Actual ◆ G:F



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Nitikanchana et al., 2014

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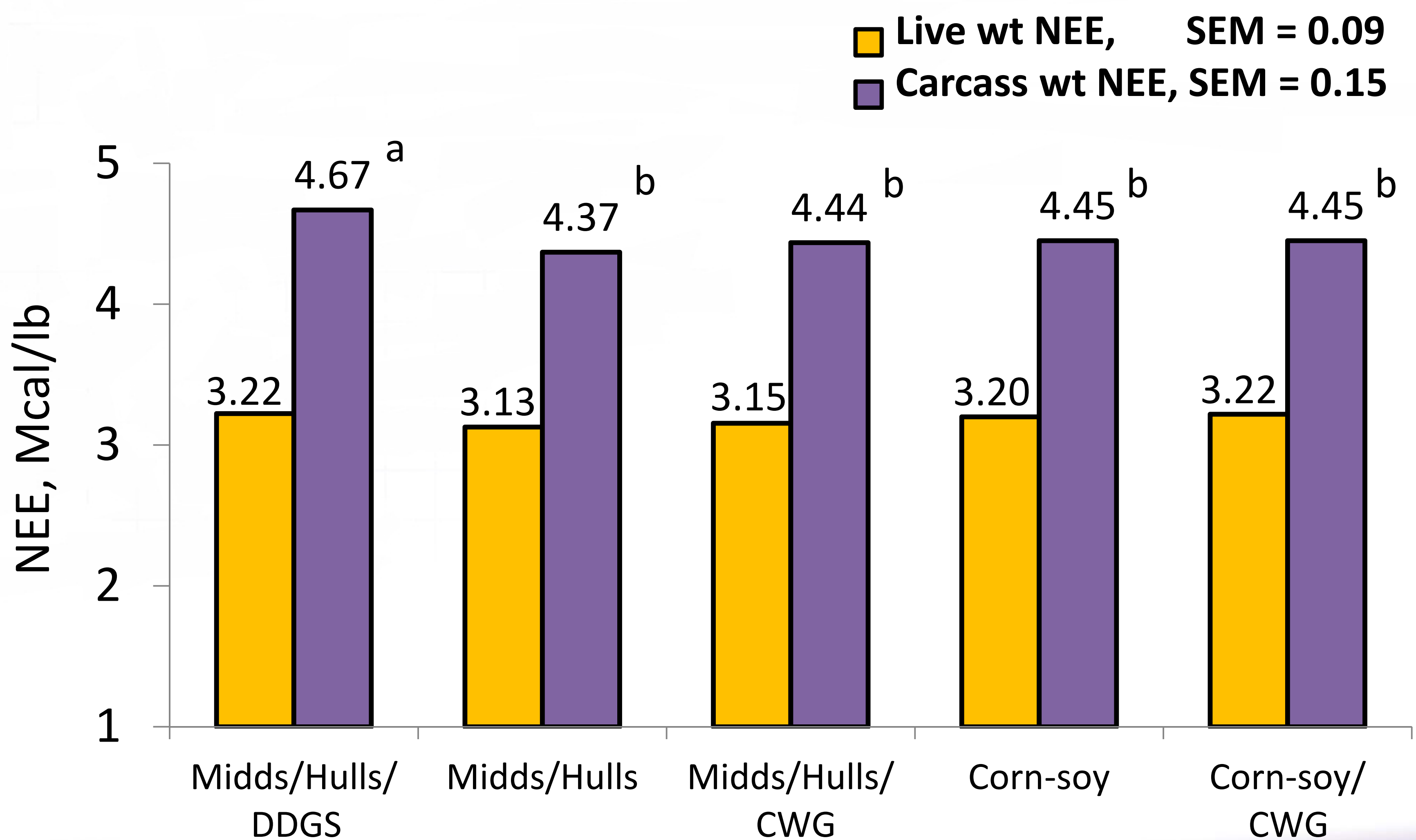
Results : NE caloric efficiency (NEE)



Nitikanchana et al., 2014

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KSU Swine Day 2013

Summary

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Exciting times in pork production!

	SEW pig price, $/pig	Weekly change
Average price	$73.69	↑ 5.97
Low price	$65	↑ 7.00
High price	$82	↑ 7.00

Cooney, Pork Network, 11/18/2013

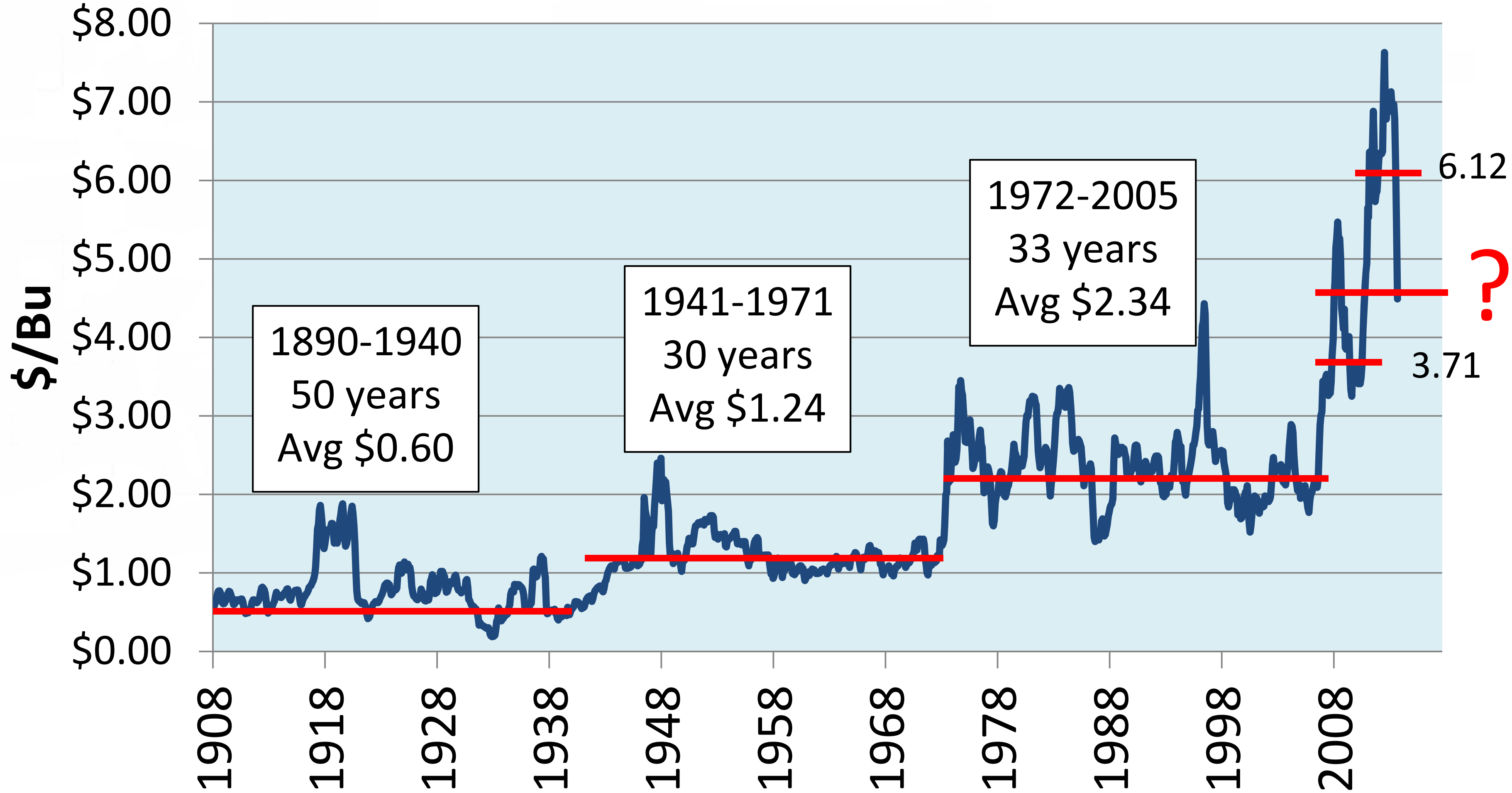
Contract	Lean hogs, $/cwt
Dec, 2013	85.40
Feb, 2014	89.975
Apr, 2014	92.50
May, 2014	97.225
June, 2014	98.45
July, 2014	96.80
Aug, 2014	94.75
Oct, 2014	81.925

Exciting times in pork production!

For the Week Ended	11/15/2013	Weekly Change
Weaner pig breakeven	**$84.29**	($1.36)
Margin over variable costs	**$106.12**	($1.36)
Pig purchase month	Dec, 2013	Nov, 2013
Live hog sale month	May, 2014	May, 2014
Lean hog futures	$98.65	($0.98)
Weighted average sbm futures	$403.08	($8.59)
Weighted average corn futures	$4.35	($0.08)
Nursery cost/space/yr	$35.00	$0.00
Finisher cost/space/yr	$40.00	$0.00
Other feed cost	$21.50	$0.00
Assumed carcass weight	205	0.00

Cooney, Pork Network, 11/18/2013

Average corn price received by U.S. Farmers



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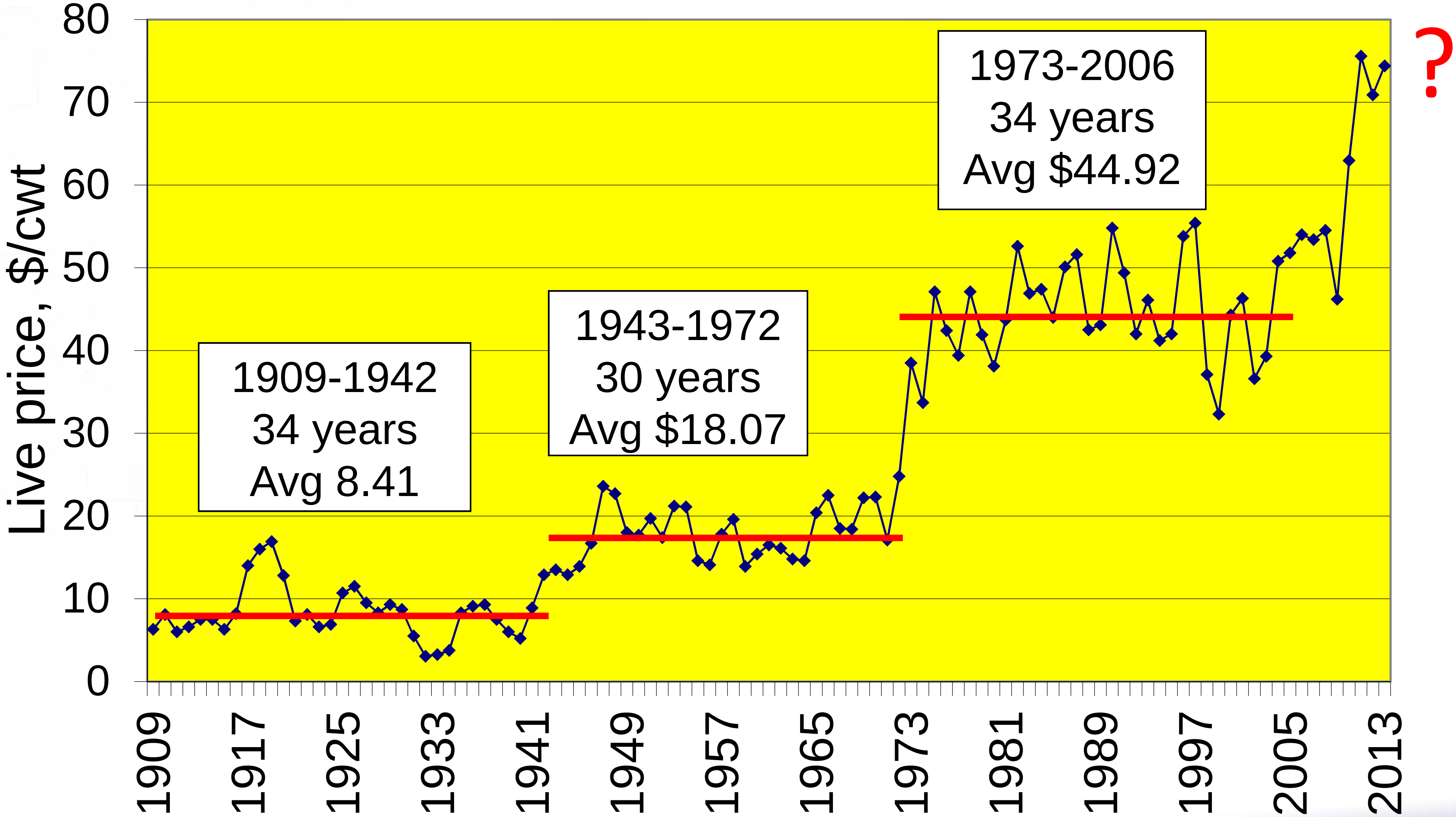
Historical Hog Prices



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KSU Swine Day Research Summary

- Breeding sows in lactation is possible
  - More work is needed to determine protocol and whether it is feasible in commercial production
- DDGS energy levels are highly variable
  - oil doesn't tell everything, but important for NE
  - Withdraw for at least 20 d before market
- DDGS has priced itself out of many diets
  - Use of L-Trp drives economics currently
    - Can you add it at appropriate levels in your mill
  - New economic model at www.KSUswine.org

KSU Swine Day Research Summary

- Superdosing of phytase appears to provide value in the nursery and early grower
- Paylean appears to increase the Zinc requirement
- TBCC provides value in finishing pig diets
- Low Trp:Lys levels increase risk
- Particle size
  - Less than 500 for F/G, but lowers ADG
  - Recommend 500 to 600 microns until further notice
- Each 100 kcal/kg of NE increases ADG by 11 g/d
  - 100 kcal/lb = 0.056 lb/d

KANSAS STATE UNIVERSITY

Search web, people, directories

Browse A-Z Sign in

K-State home » College of Agriculture » ASI » Species » Swine » Research and Extension

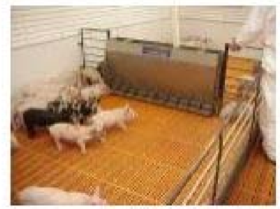
Animal Sciences and Industry

www.KSUswine.org

- ASI Home
- People
- About Us
- Students & Programs
- Species
  - Beef
  - Dairy
  - Equine
  - Poultry
  - Sheep & Goats
  - Swine
    - Research & Extension
      - Feeder Adjustment Cards
      - Calculators
      - Gestation Feeding Tools
      - Particle Size Information
      - Premix & Diet Recommendations
      - Swine Nutrition Guide
      - Marketing Tools
    - Teaching
    - People
    - Swine Day
    - Swine Profitability Conference
    - Swine Unit
- Research & Extension

Swine Research and Extension

The Kansas State University Swine Extension program takes practical swine nutrition research and works with producers to facilitate rapid adoption of technology by the industry. The program also works with producers in the area of environmental management of swine facilities.



Swine Nutrition Resources

- Premix & Diet Recommendations
- Swine Nutrition Guide, November 2007 Edition
- DDGS, Added Fat, and Amino Acid, Meat and Bone Meal, Phytase, and Feed Budget Calculators
- Feeder Adjustment Cards
- Gestation Feeding Tools
- Particle Size Information
- Marketing Tools
- Aflatoxin fact sheet

Swine Research Index

K-State swine research publications can be searched at

http://krex.k-state.edu/dspace/

Journal Publications

Journal Abstracts

Swine Day Publications

Swine Day Presentations

Swine Day 2013 (pdf) Swine Day 2012 (pdf) Swine Day 2011 (pdf)

Quick Links

- Pork Information Gateway
- Kansas Pork Association
- National Pork Board (NPB)
- NPB trucker Quality Assurance
- NPB Pork Quality Assurance
- NPB Pork Science
- KSU Livestock Budgets
- KSU AgManager
- Swine Feed Efficiency

Upcoming Events

Sowbridge Breeding Herd Education Series 2012-2013
Multiple Locations
Multiple Dates
Sowbridge Brochure

Porkbridge
Multiple Locations
Multiple Dates
Porkbridge Brochure

Swine Day
KSU Alumni Center
November 21, 2013
Read more...

Swine Research Faculty

Dr. Duane L. Davis
Swine Reproductive Physiology

Dr. Joel DeRouchey
Environmental management

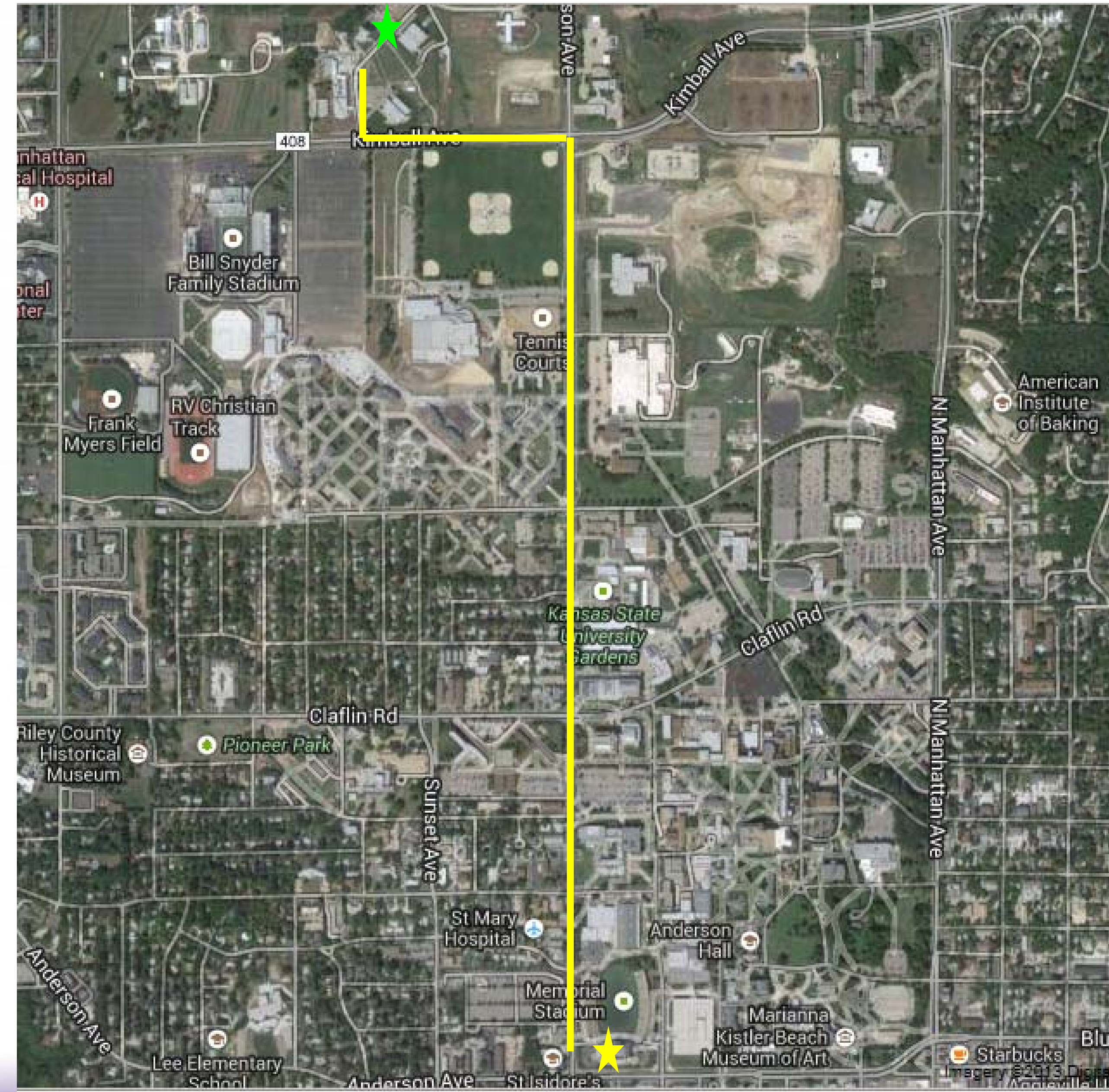
Dr. Robert D. Goodband
Swine nutrition & management

Dr. Joe D. Hancock
Monogastric Nutrition

Dr. Jim L. Nelssen
Swine nutrition & management

Dr. Mike Tokach
Swine nutrition

Directions to OH Kruse Feed Mill



North on Denison Ave. about 1.25 miles

West (Left) on Kimball Ave. about .25 miles

Right into the Grain Science Complex

Knowledge *for* Life

Thank You!

KSUswine.org

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Pellet quality

Pellets with fines

Good quality pellets

K·STATE Research and Extension

Nemecheck et al. 2012

K-State Web Resources
www.ksuswine.org

- DDGS Calculator
- Synthetic Amino Acid Calculator
- Fat Analysis Calculator
- Feed Budget Calculator
- Feeder Adjustment Cards
- Particle Size Information
- Marketing Calculators
- Gestation Feeding Tools

Every 100 microns =

1. F/G improves by ~1.2%
2. 7 lbs less feed/finishing pig
3. Current $0.98/pig savings in feed cost

Grain Particle Size

- F/G directly impacted by particle size of cereal grains
- Research in high co-product diets:
  - While corn in diet is decreased, finishing pigs still respond similarly to improved F/G with reduced corn particle size
  - Whole diet grinding – not a benefit in meal diets
  - <u>High fiber, low digestibly ingredients may be negatively affected by particle size reduction.</u>
- Takes more time/energy to grind cereals finer, however, less total tonnage is manufactured by the mill.
- Testing method impacts results:
  - Lab using a flow agent will report a value approximately 80 µ lower then actual.