Importance of Distillers in Ruminant Diets

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EXTENSION

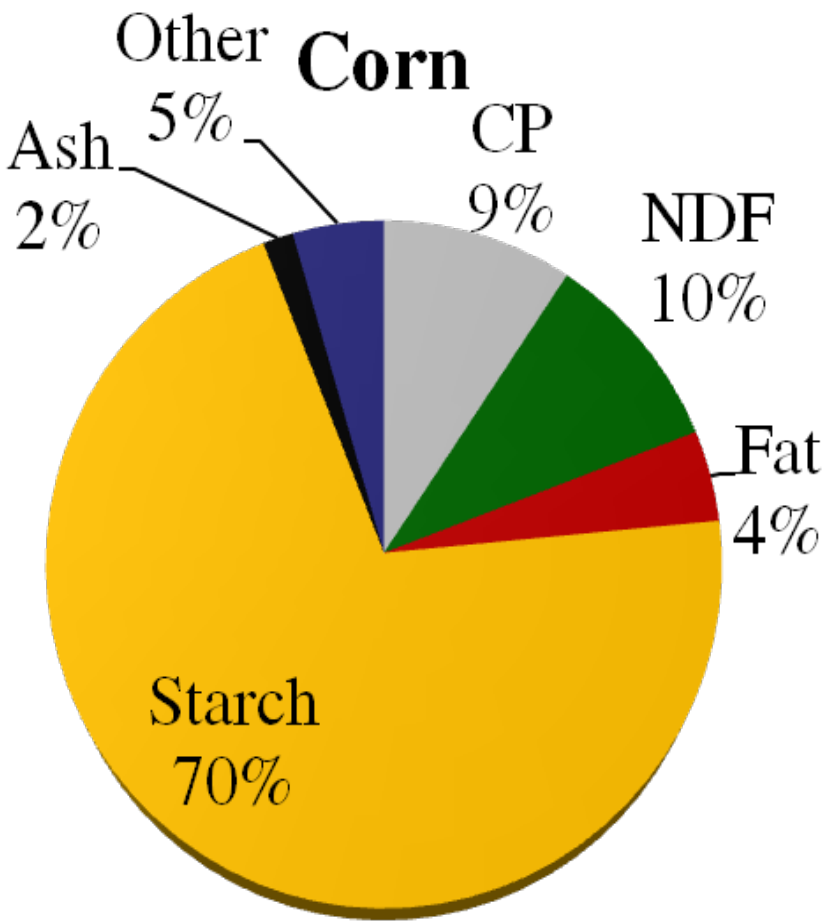
USE OF DISTILLERS GRAINS

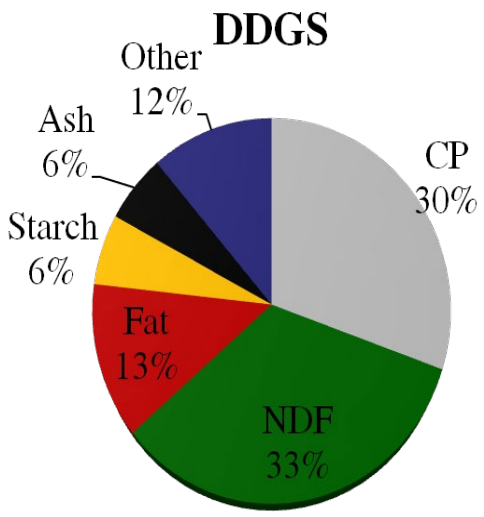
- Inclusion < 15-20% (< 2 lb/d)
  - providing protein needs
  - been done for 200+ years
  - good bypass protein for cattle

- Inclusion > 20% (> 3 lb/d)
  - energy replacement when fed above 20%
  - still provides protein, excess protein used for energy
  - price competitive to corn, maximum ~40%

N EXTENSION

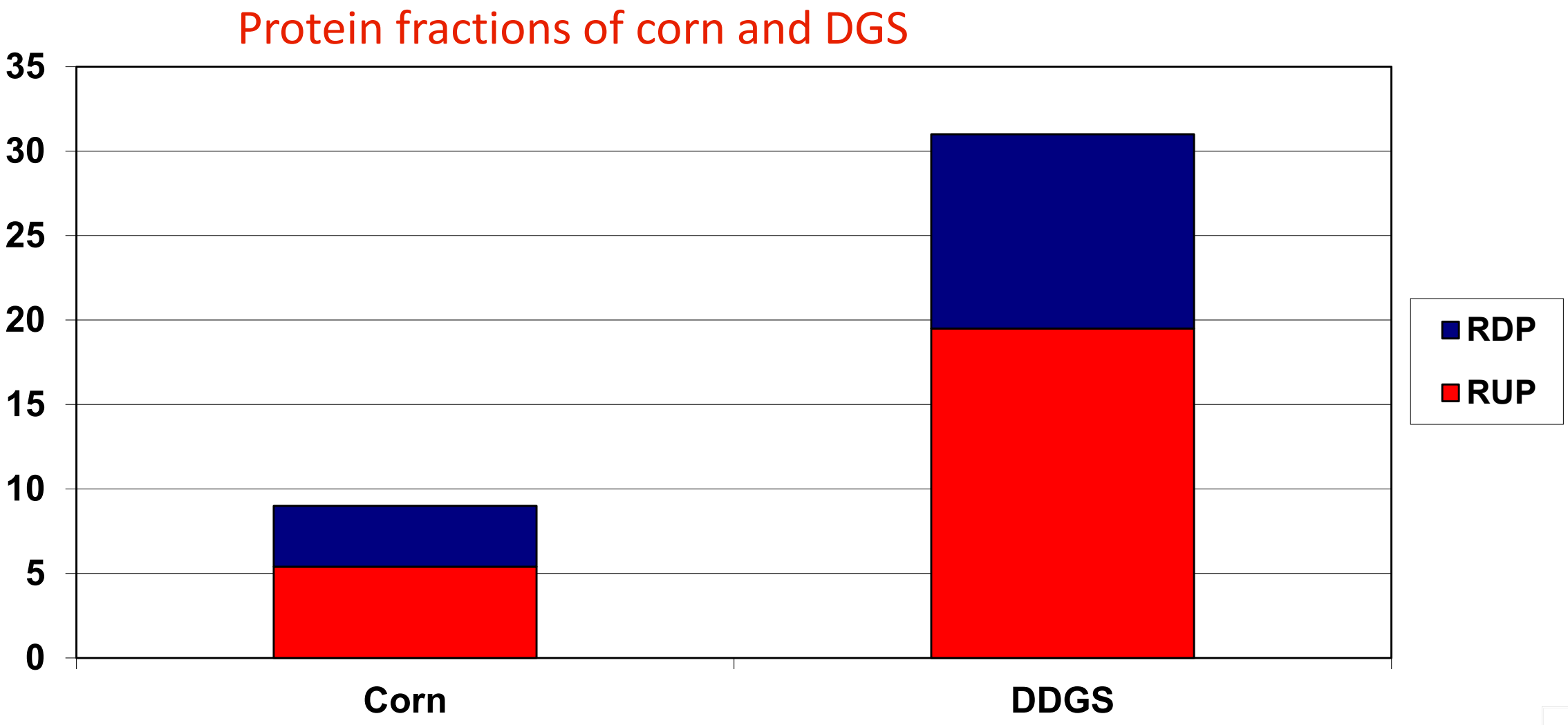
Distillers Grains





1/3 as much

Distillers Grains



Distillers Grains

- Feedyard cattle: protein (0-15%), energy (>15%)
- Growing cattle (forage diets): protein (0-15%), energy (>15%)
- Beef cows: protein supplement (1-2 lb/d)
- Beef cows: energy supplement (combine with LQ forage)

- Protein is not the only determinant of feed quality!

Distillers Grains Pricing

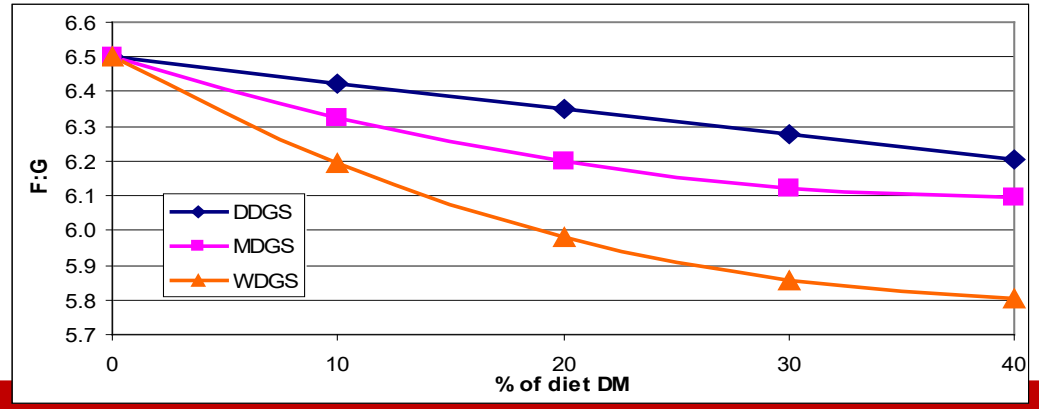
- If energy source; compete with corn
- $5.00/bu corn = $211.33/ton (DM)
  - 3.00/56*2000/0.845
  - IF EQUAL TO CORN
    - DDGS (91% DM): $192 as-is
    - MDGS (43% DM): $91 as-is
    - WDGS (33% DM): $70 as-is

- Been running premium to corn (used as protein source)
- Encourages lower inclusions in feedyards

Distillers in Finishing Diets

Value of DGS, relative to corn

	Dietary Inclusion Tested, % of diet DM			
	10	20	30	40
WDGS	150%	143%	136%	130%
MDGS	128%	124%	120%	117%
DDGS	112%	112%	112%	112%



Bremer et al., 2011
Prof. Anim. Scient.

Distillers in Finishing Diets

	WDGS	MDGS	DDGS	*P*-value
Performance[1]				
DMI, lb/d	24.8[a]	26.4[b]	27.1[b]	< 0.01
ADG, lb	4.11	4.17	4.05	0.30
F:G	6.06	6.33	6.67	<0.01

[a,b,c] Means with different superscripts differ (*P* - value < 0.05)

[1] DMI - Dry matter intake; ADG - Average daily gain; F:G – lb feed per lb of gain

Nuttelman et al., 2011 NE beef report

Distillers in Finishing Diets

	WDGS	MDGS	DDGS	Corn
Performance[1]				
DMI, lb/d	24.8[a]	26.4[b]	27.1[b]	24.6
ADG, lb	4.11	4.17	4.05	3.58
F:G	6.06	6.33	6.67	6.85

[a,b,c] Means with different superscripts differ (P - value < 0.05)

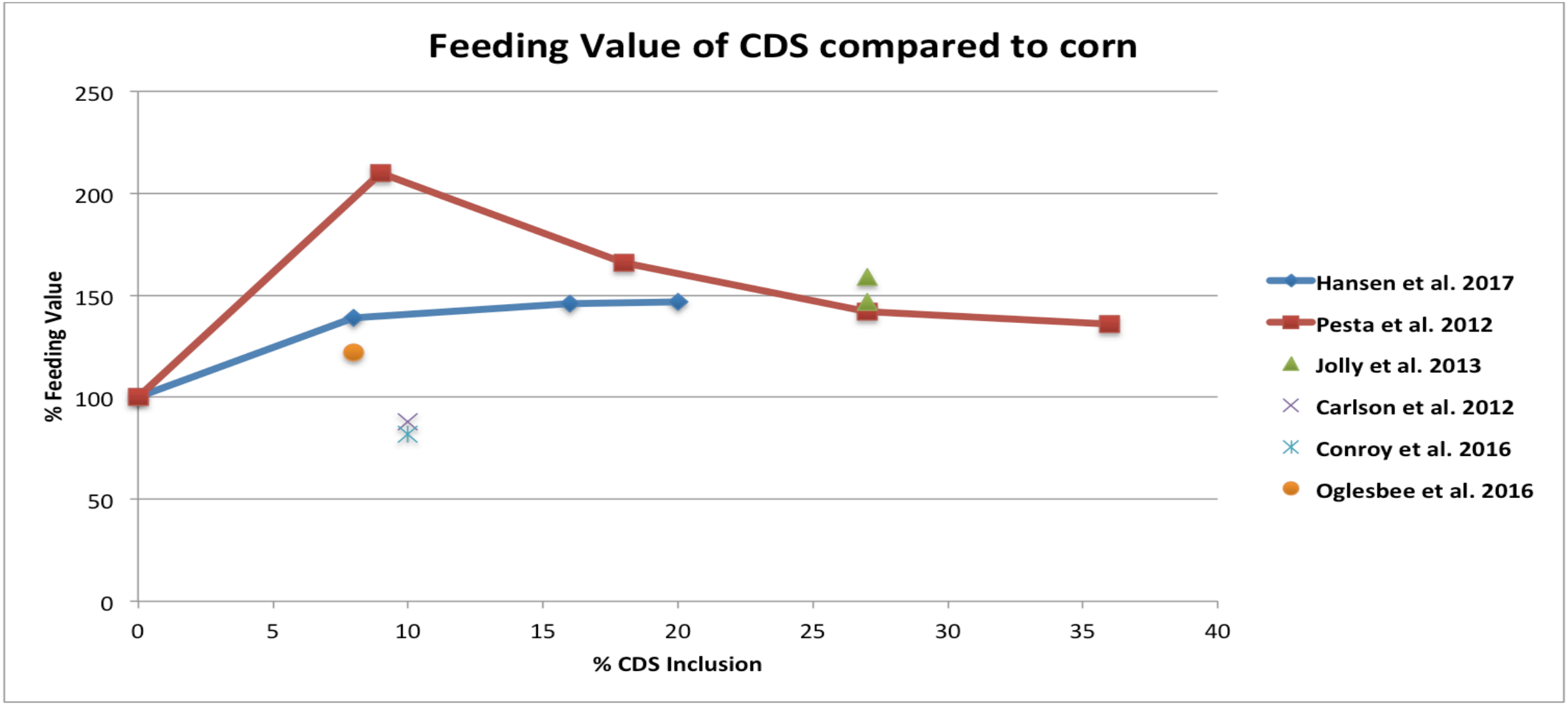
[1] DMI - Dry matter intake; ADG - Average daily gain; F:G – lb feed per lb of gain

Nuttelman et al., 2011 NE beef report

Distillers Grains-oil removal

Reference	Item	Inclusion	Corn Control	Traditional Distillers	De-oiled Distillers	Trial SEM	% reduction
Jolly et al., 2013	DRC	40%	0.157[a]	0.176[b]	0.175[b]	0.004	0.5
Jolly et al., 2014	DRC	50%	0.155[a]	0.167[b]	0.163[b]	0.002	2.4
Bremer et al., 2014	Exp. 1 DRC	30%	0.140[a]	0.152[b]	0.147[b]	0.002	3.2
Bremer et al., 2014	Exp. 2 DRC	35%	0.127[a]	0.148[b]	0.144[b]	0.004	2.7
Bremer et al., 2014	Exp. 2 SFC	35%	0.140[a]	0.155[b]	0.147[b]	0.004	5.2
Burhoop et al., 2018	DRC	40%	0.148[a]	0.159[b]	0.157[b]	0.003	1.2
Average	-	38%	0.145	0.160	0.156	0.003	2.5
				If 2.5/0.38 (note, all NS)			8.3

Syrup (distillers solubles)



Low distillers grains inclusion

	Distillers			*P*-Value	
	10	15	20	Lin	Quad
ADG, lb	**4.16**	**4.25**	**4.29**	0.06	0.65
DMI, lb/d	**23.5**	**23.2**	**22.6**	<0.01	0.55
F:G	**5.65**	**5.46**	**5.26**	<0.01	0.93

Boyd et al., 2019 Nebraska Beef Report

Low distillers grains inclusion

	Distillers inclusion		
	12	20	*P-value*
ADG, lb	**4.24**	**4.35**	0.04
DMI, lb/d	**25.7**	**25.2**	0.04
F:G	**6.06**	**5.78**	<0.01

Boyd et al., 2019 Nebraska Beef Report

Distillers grains and urea

PROTEIN ISSUE WITH **LESS** DISTILLERS IN FINISHING DIETS

NEED TO KEEP 10% (DM BASIS) ADD UREA

EXTENSION

WHY WDGS/MDGS

- Bypass protein (RUP), great for calves and backgrounding
- Palatable (very)
- Energy relative to corn
- >20% when <110% of corn
- More expensive, then decrease inclusion (10-15% essential)
- Evaluate $/ton of TDN (energy)
- Processed and ready to feed
- Adds moisture, sticky

WHY NOT

- Supply is challenge; plant, trucking, contracts
- Price variation by month
- Wet/sticky
- Storage challenges
- Perception of less benefit
- Buy it (vs feeding corn supply)

N EXTENSION

Flaking details

25-45 minutes steaming
Adding 5-8% moisture
Add moisture initially to 17-18%
Flake density
- lb/bu or bushel wt
- flake thickness
- starch availability

Optimum: 26 to 28 lb/bu

Gelatinization of starch concept
Small intestinal digestion
(amylase production limited)

Authors:
Zinn
Huntington
Harmon

Distillers grains and corn processing

Corn Processing-**without** WDGS

Owens et al. (1997)

	DRC	HMC	SFC
DMI, lb	20.8[a]	19.2[b]	18.4[c]
ADG, lb	3.19[a]	3.01[b]	3.15[a]
Feed / Gain	6.57[a]	6.43[a]	5.87[b]
Feed / Gain, % of DRC	--	102	112

Owens et al. (1997) summarized performance from 521 research trials which fed DRC, HMC, or SFC

Distillers grains and corn processing

Corn Processing-with WDGS

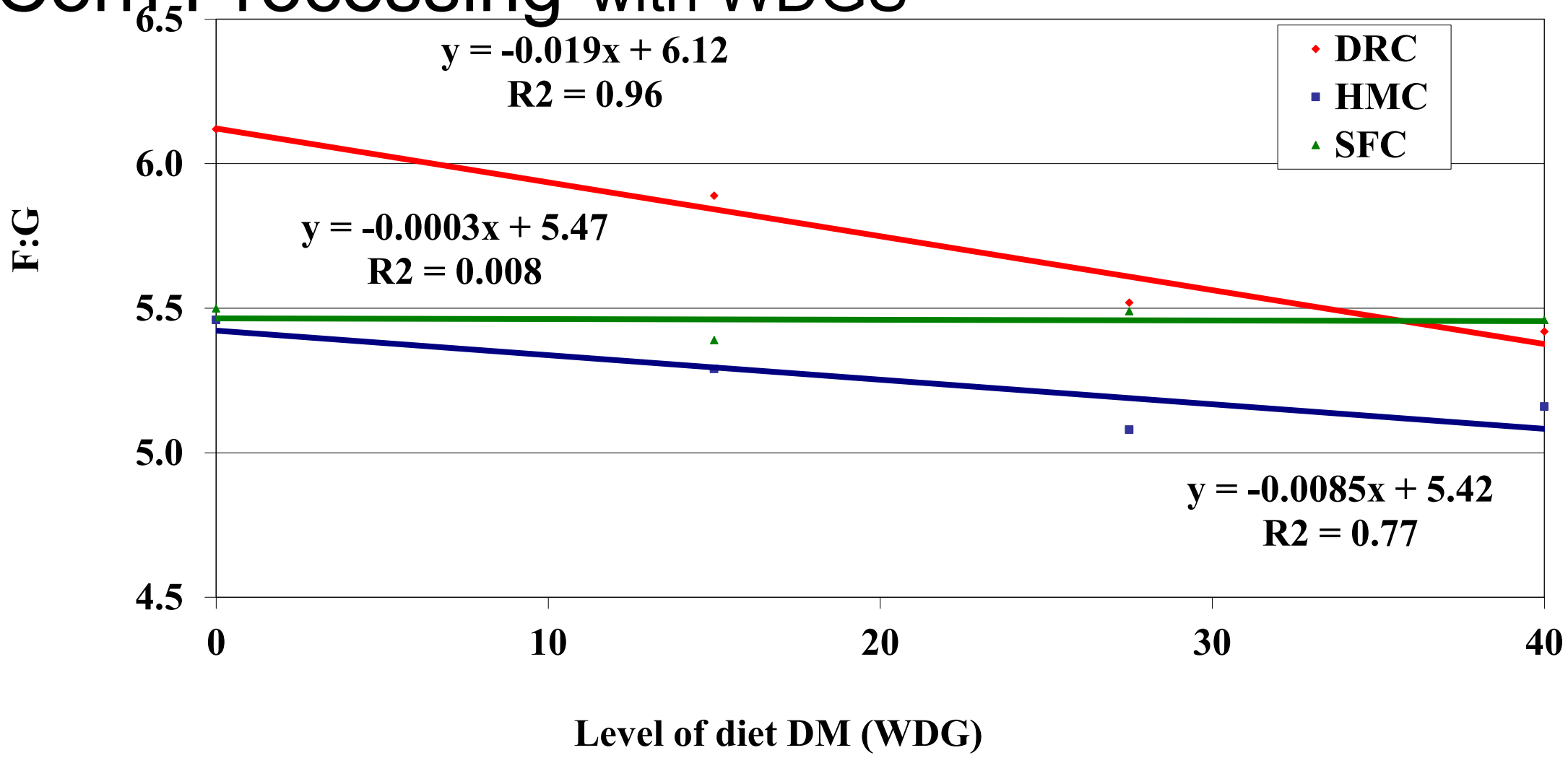
	WC	DRC	HMC	SFC
DMI	23.1[a]	22.6[a]	21.0[bc]	20.4[c]
ADG	3.85[a]	4.05[b]	3.89[ab]	3.59[c]
F:G	6.07[a]	5.68[bc]	5.46[c]	5.76[b]
Corn:	-11.2	--	6.3	-2.3

All diets contained 30% WDGS; 61.4% corn
Calf-feds 168 days, initial weight = 700 lb

Vander Pol et al., 2006 Nebraska Beef Rep.

Distillers grains and corn processing

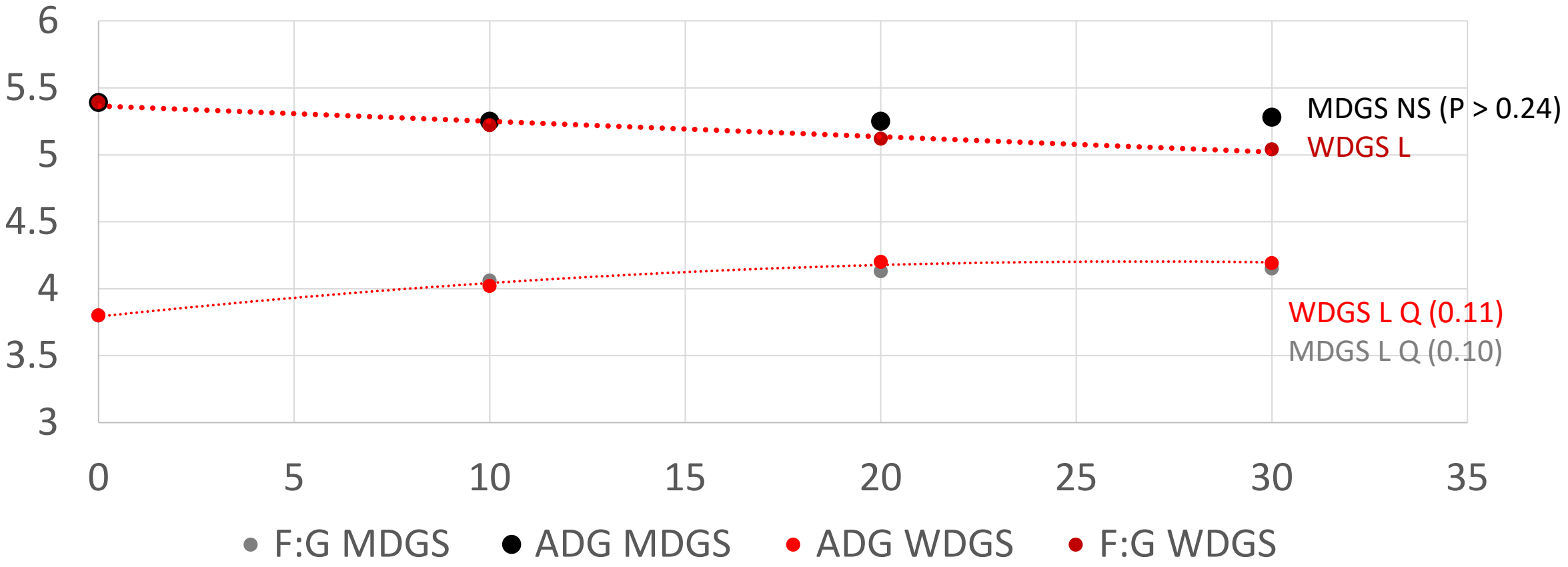
Corn Processing-with WDGS



Corrigan et al., 2007 Nebraska Beef Rep.

Distillers grains and corn processing

Corn Processing-with WDGS



Troyer et al., 2022 Nebraska Beef Rep.

Distillers in Growing Diets

Summary of Growing Response[1]		
	WDGS	DRC
DMI, lb/d	16.5	16.5
ADG, lb/d	2.47	2.36
G:F	0.150	0.143

[1] 3 experiments comparing DRC to WDGS; inclusions of WDGS were 15-35% and DRC was 22-60%
Goal was to be similar in energy provided

Ahern et al (2016) Prof. Anim. Scient.

Distillers in Growing Diets

Wet Versus Dry Distillers Grains Growing Diets		
	WDGS	**DDGS**
DMI, kg	15.6	16.5
ADG	2.27	2.31
G:F	0.147	0.141

Distillers in Growing Diets

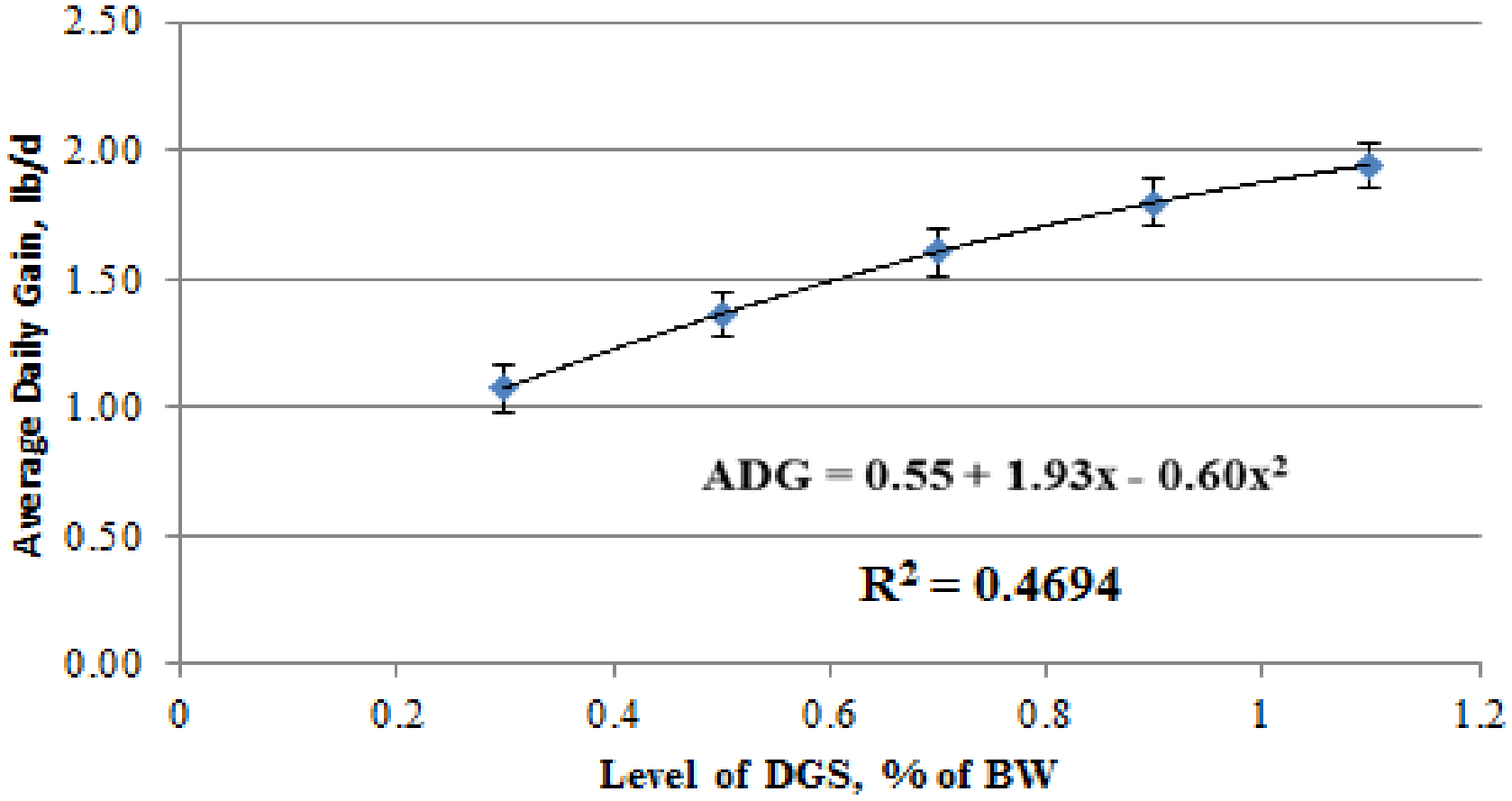
Energy value of Distillers Grains in Forage based diets

- DRC 83% TDN
- DG 113% TDN (136% DRC)
- Conservative DDGS TDN = 108%

- Lab based energy values - meaningless

Distillers in Growing Diets

DDG SUPPLEMENTATION ON GRAZED CORN RESIDUE – 3 TRIAL POOLED SUMMARY

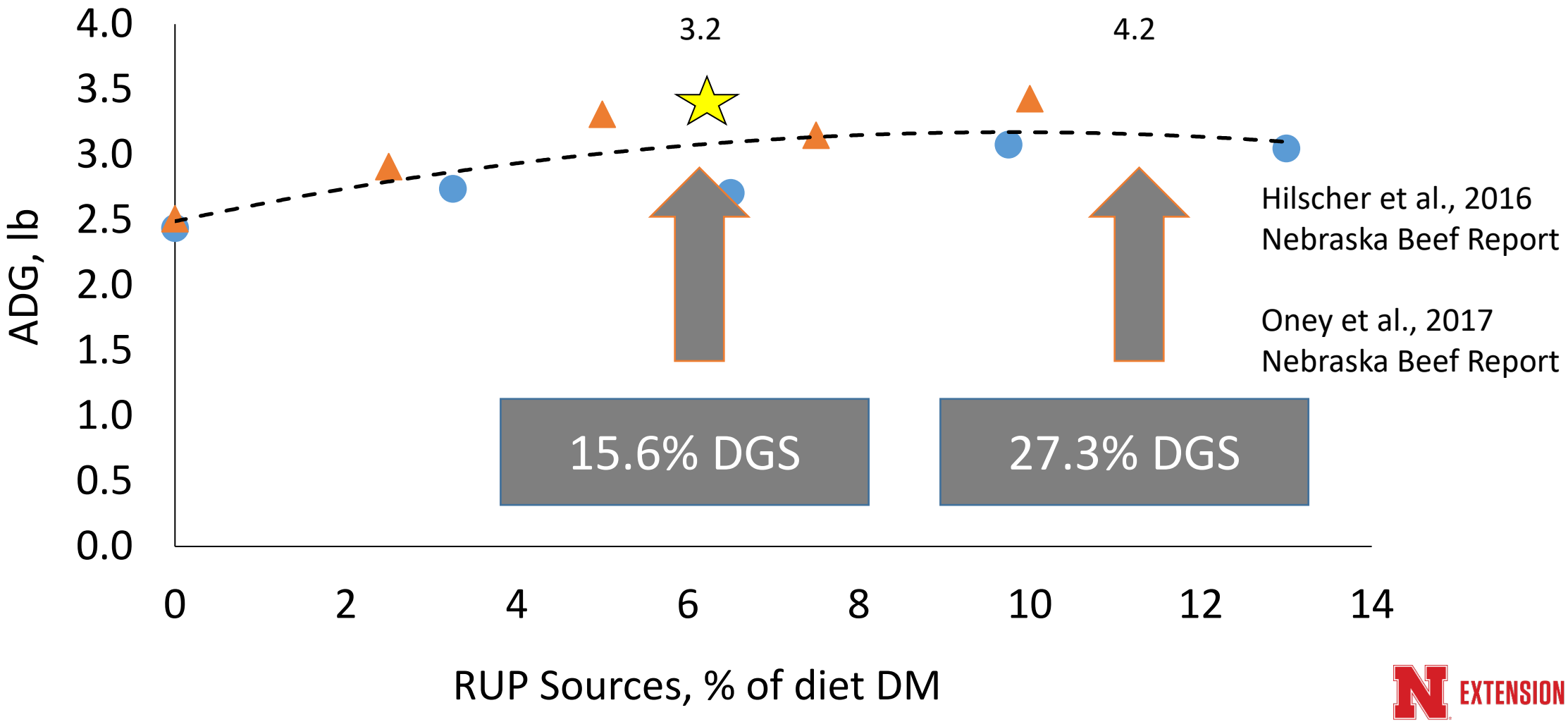


0.75% BW of a 650 lb calf is 5 lbs

Welchons and MacDonald, 2016

Distillers in Growing Diets

PROTEIN SUPPLEMENTATION IN SILAGE DIETS (RUP)



EXTENSION

New distillers (ICM)

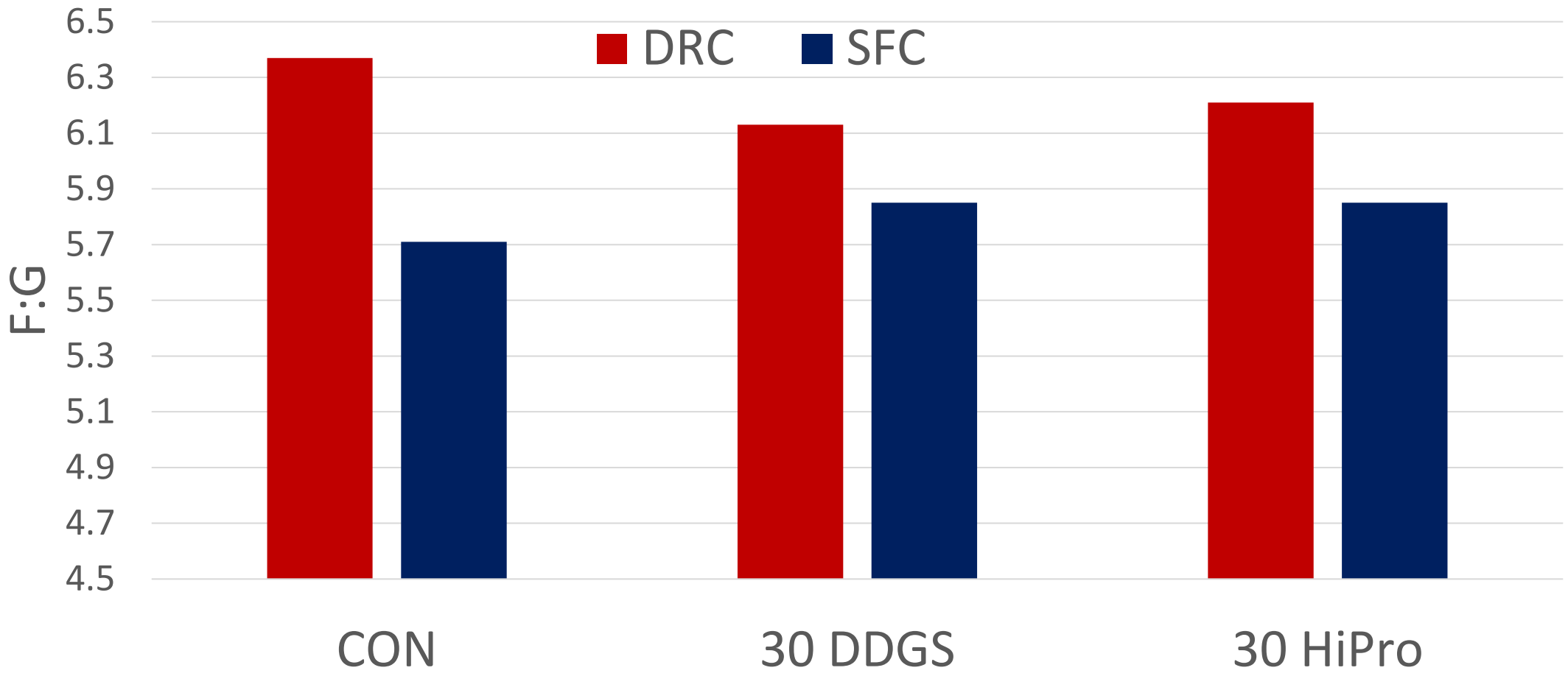
Ingredient	CONTROL	BRAN+SOL 20	BRAN+SOL 40	WDGS 20	WDGS 40
DRC	44	34	24	34	24
HMC	44	34	24	34	24
Grass Hay	7	7	7	7	7
Bran + Solubles	-	20	40	-	-
WDGS	-	-	-	20	40
Supplement	5	5	5	5	5

Garland et al., 2019 Nebraska Beef Report

New distillers (ICM)

						BRAN+SOL	WDGS
	CON	20BRAN+SOL	40BRAN+SOL	20WDGS	40WDGS	Lin.	Lin.
DMI, lb/d	27.0[c]	29.0[ab]	29.4[ab]	29.8[a]	28.4[b]	**L,Q**	L
ADG, lb/d	3.73[b]	4.22[a]	4.29[a]	4.26[a]	4.33[a]	**L,Q**	**L**
F:G	7.19	6.86	6.83	6.96	6.55	L	L
Feeding Value	-	125%	113%	118%	125%	-	-

Higher Protein DDGS



Ovinge et al., 2019 Nebraska Beef Report

ISSUES

- Higher protein doesn't guarantee better livestock feed
- Need feeding data BEFORE new process adoption
- Losing synergy with feedyard industry, careful
  - Example: Steam-flaking in Nebraska, limit inclusion to <15% inclusion (or does it?)
- Fibrous feeds still an opportunity for beef cattle, priced lower? Quantity greater than high-protein, but value lower
- Issues may be different from cow, growing calf, feedyard, dairy
- Beef cattle: Only ones to get more out of distillers than corn

Conclusions

- Distillers Byproducts
  - Protein (RUP) is needed in many situations
  - “excess” protein is used for energy (and contributes lots)
  - Use as a protein source (growing, young, light)
  - Wetter is better
  - De-oiled is slightly worse (DGS)
  - De-oiled worse (syrup)
  - Feed syrup if available and economical
  - Just decreasing from 20% to 10% impacts performance
  - Will get more complex, with process changes
  - Know the end use

Conclusions

WDGS/MDGS BENEFITS

- Ration conditioning: Hold diet together, prevent sorting
- Can use low quality roughage: Stalks, straw, poor hay, etc
- Decreased cost (TDN, energy, protein basis)

N EXTENSION

Issues for Plants

- Inclusions matter on a dry basis only (just like price)
- Example, most diets (20% inclusion dry = 35 to 40% inclusion on an as-is basis)
- So, feedyards decreasing from 20% to 10% as-is, are LOW
- Will it go back to a “protein” market
- Can’t run them out
- Variable prices are bad (80% to 150% of corn)
- Perception is that price > corn is not economical
- Been a challenging time with supply/inclusion/price

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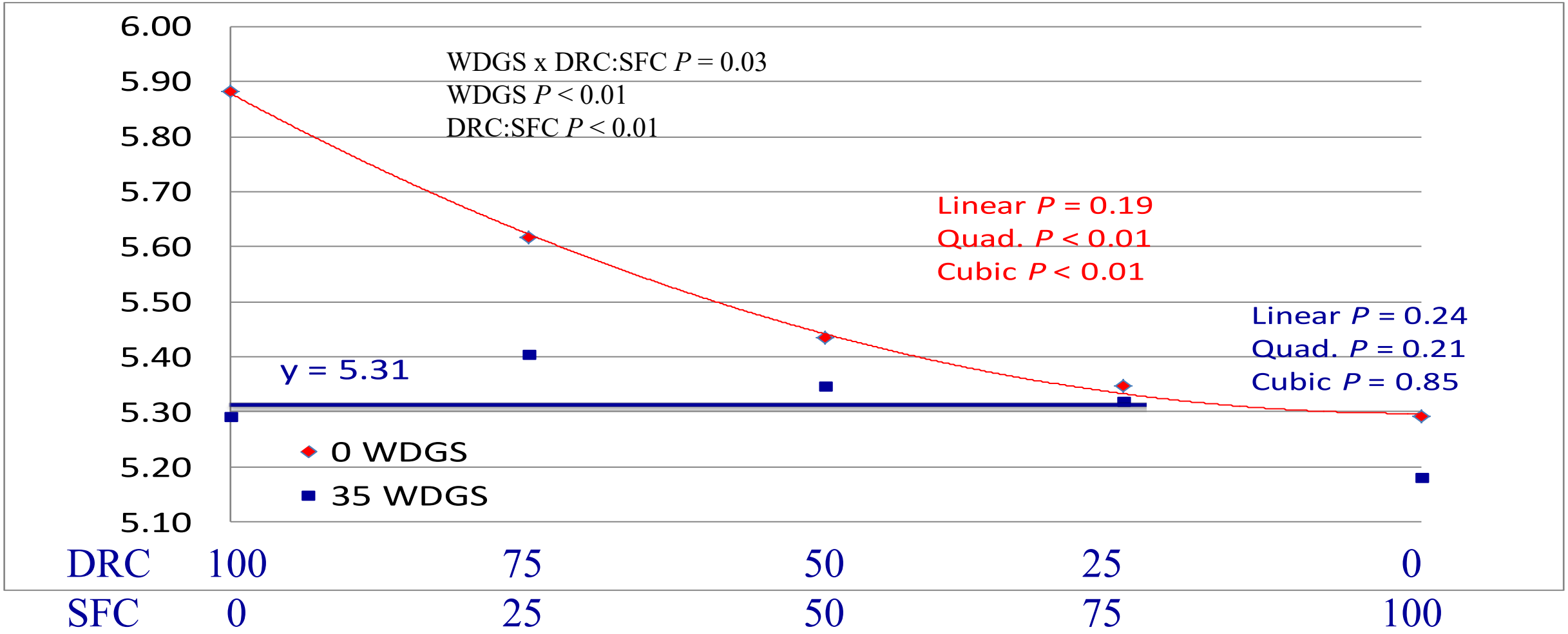
WDGS & Grain Processing



Nichols et al., 2011 Midwest ASAS meetings