Reducing soybean meal import for dairy cattle by using DDGS or rumen protected soybean meal

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REDUCING SOYBEAN MEAL IMPORT

WHY?

- Increasing prices

- Environmental impact

REDUCING SOYBEAN MEAL IMPORT

HOW?

- Locally-produced protein source (e.g. rapeseed meal)
- Increasing by-pass protein content in soybean meal
- By-products of bio-ethanol industry

AIMS

Evaluation

- treated soybean meal
- bio-ethanol byproducts

3 animal trials with high producing dairy cattle

Soybean meal and concentrate use

Zootechnical performance

MATERIALS & METHODS

1. Rumen protected soybean meal

2. Dried distiller grains & solubles (DDGS) at low and high dose

3. Wheat and maize DDGS

MATERIALS & METHODS

3 animal trials with high producing dairy cattle

Latin Square experiments (3x3)

- ✓ Individual feeding
- ✓ 18-21 high producing dairy cows
- ✓ Group division based on MP, milk content,…

MATERIALS & METHODS

- ✓ MS (50-65%) & GS (35-50%) ad lib
- ✓ Concentrates
- ✓ 105% NE_L and DPI requirements

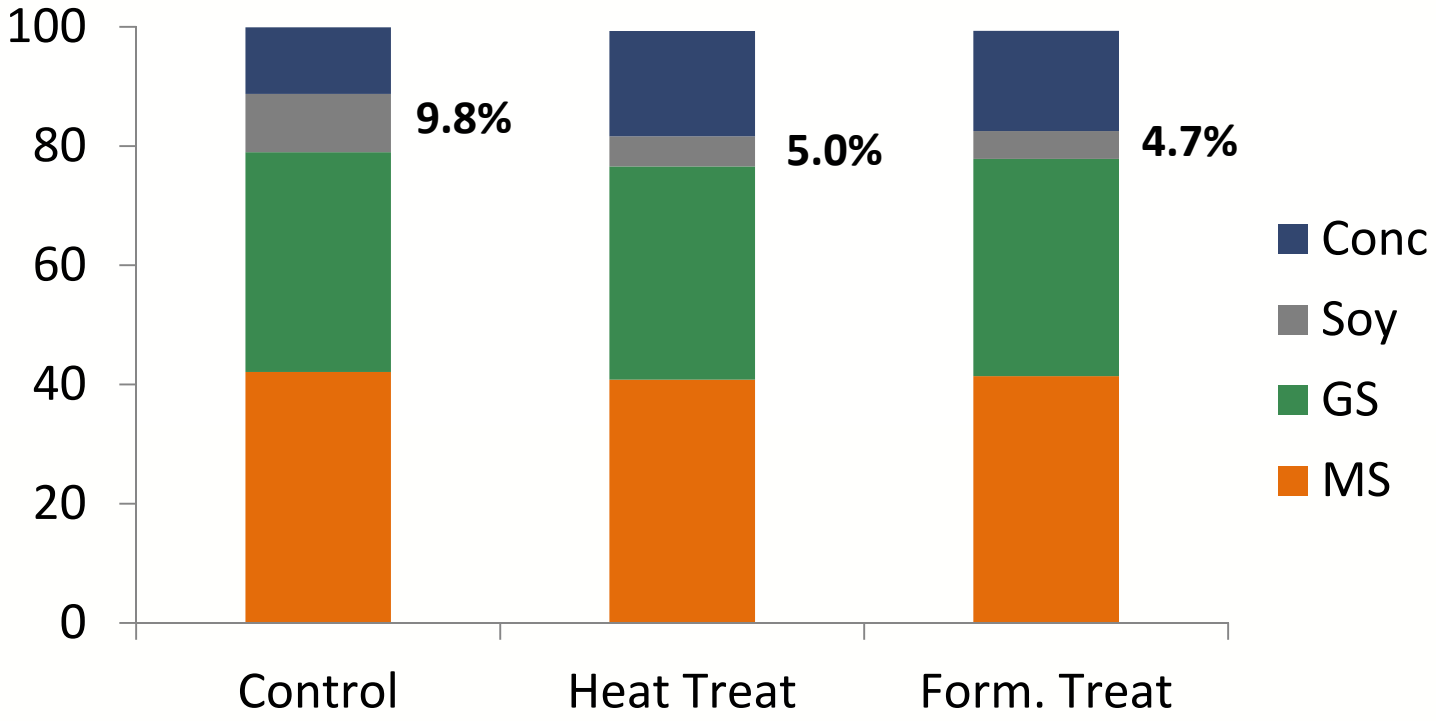
RESULTS

1. Rumen protected soybean meal

Control	**Heat treated**	**Form. treated**
Untreated soybean meal	Heat treated soybean meal	Formaldehyde treated soybean meal
	DPI ↑	NE_L =
		RDPB ↓
1kg soybean meal	0.51 kg Heat treated	0.49 kg Form. treated
	0.55 kg Low prot. conc.	0.58 kg Low prot. conc.
	Urea (66g) eventually	Urea (68g) eventually

RESULTS

1. Rumen protected soybean meal



RESULTS

1. Rumen protected soybean meal

Feed intake and performances

	Control	Heat treat.	Form. treat.	p-value
DMI (kg/day)	**22.0** ± 0.4	**22.0** ± 0.4	**22.4** ± 0.4	0.25
MP (kg/day)	**28.7** ± 0.8	**28.4** ± 0.7	**28.5** ± 0.8	0.40
Fat (%)	**4.46** ± 0.08	**4.43** ± 0.06	**4.34** ± 0.09	0.25
Protein (%)	**3.39** ± 0.05	**3.39** ± 0.03	**3.31** ± 0.06	0.27

RESULTS

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Fat (%)	**4.46** ± 0.08	**4.43** ± 0.06	**4.34** ± 0.09	0.25
Protein (%)	**3.39** ± 0.05	**3.39** ± 0.03	**3.31** ± 0.06	0.27
Fat prod (g/day)	**1276** ± 40	**1256** ± 35	**1234** ± 42	0.15
Prot prod (g/day)	**969** ± 29	**961** ± 25	**941** ± 29	0.18
Milk urea (mg/L)	**184** ± 10	**179** ± 5	**173** ± 7	0.27
N-efficiency (%)	**28.7** ± 0.5	**29.0** ± 0.4	**27.9** ± 0.4	0.14

RESULTS

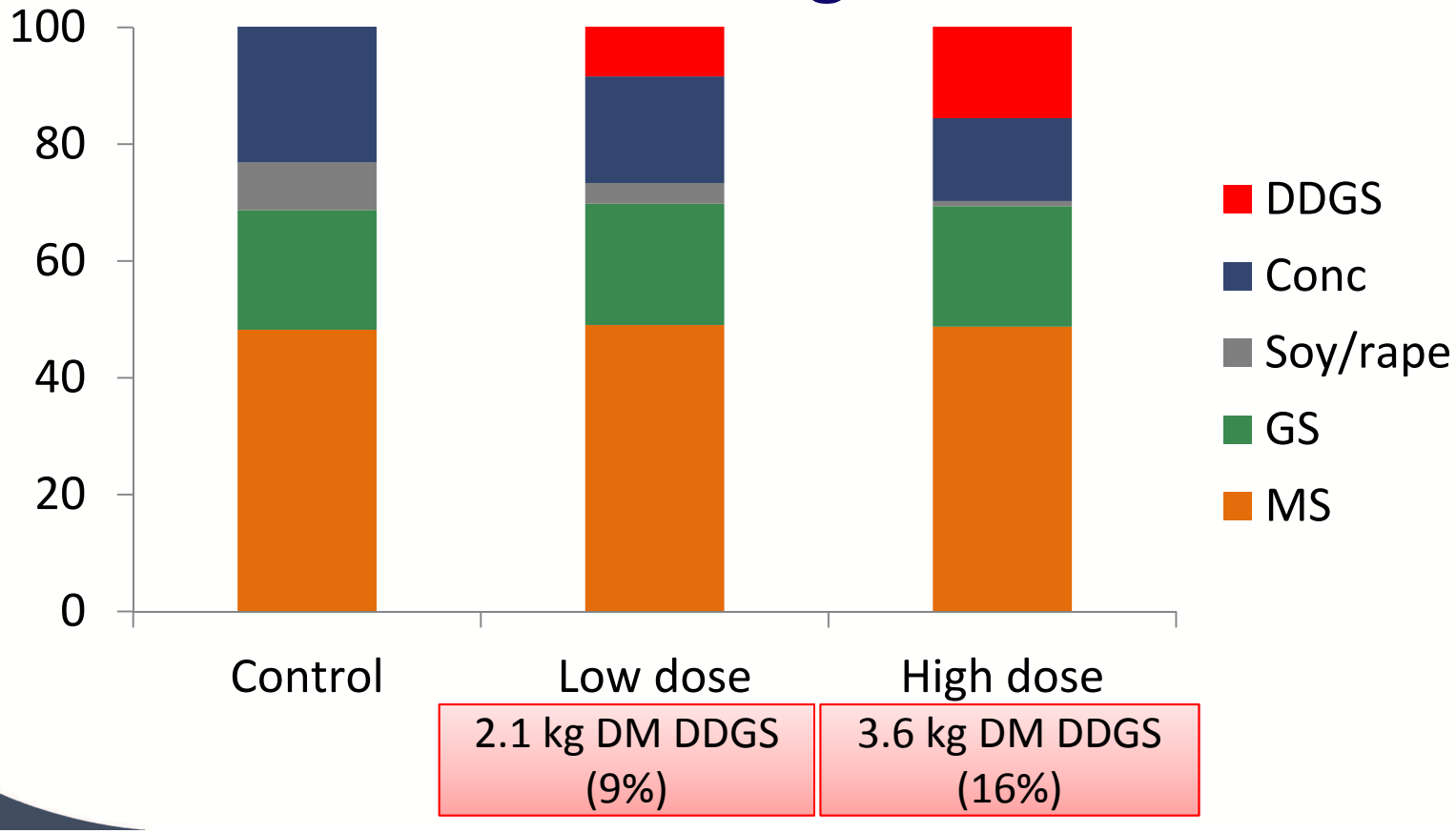
2. DDGS at low and high dose

DDGS < 70% wheat, 20% maize, 10% triticale

Control	Low dose	High dose
No DDGS	2.3-2.8 kg DDGS	3.5-4.5 kg DDGS

RESULTS

2. DDGS at low and high dose



RESULTS

2. DDGS at low and high dose

Feed intake and performances

	Control	Low dose DDGS	High dose DDGS	p-value
DMI (kg/day)	**22.0** ± 0.4	**21.9** ± 0.4	**22.1** ± 0.3	0.22
MP (kg/day)	**28.4** ± 0.6^{a}	**28.5** ± 0.6^{a}	**29.2** ± 0.6^{b}	**<0.01**
Fat (%)	**4.36** ± 0.09^{a}	**4.34** ± 0.08^{ab}	**4.22** ± 0.08^{b}	**<0.05**
Protein (%)	**3.51** ± 0.04	**3.52** ± 0.04	**3.50** ± 0.04	0.41

RESULTS

2. DDGS at low and high dose

Feed intake and performances

	Control	Low dose DDGS	High dose DDGS	p-value
DMI (kg/day)	**22.0** ± 0.4	**21.9** ± 0.4	**22.1** ± 0.3	0.22
MP (kg/day)	**28.4** ± 0.6^{a}	**28.5** ± 0.6^{a}	**29.2** ± 0.6^{b}	**<0.01**
Fat (%)	**4.36** ± 0.09^{a}	**4.34** ± 0.08^{ab}	**4.22** ± 0.08^{b}	**<0.05**
Protein (%)	**3.51** ± 0.04	**3.52** ± 0.04	**3.50** ± 0.04	0.41
Fat prod (g/day)	**1235** ± 31	**1232** ± 32	**1225** ± 28	0.82
Prot prod (g/day)	**993** ± 18^{a}	**1001** ± 20^{ab}	**1015** ± 16^{b}	**<0.05**
Milk urea (mg/L)	**270** ± 4^{a}	**280** ± 5^{b}	**293** ± 4^{c}	**<0.001**
N-Efficiency (%)	**30.3** ± 0.2^{ab}	**30.3** ± 0.3^{a}	**29.4** ± 0.4^{b}	**<0.05**

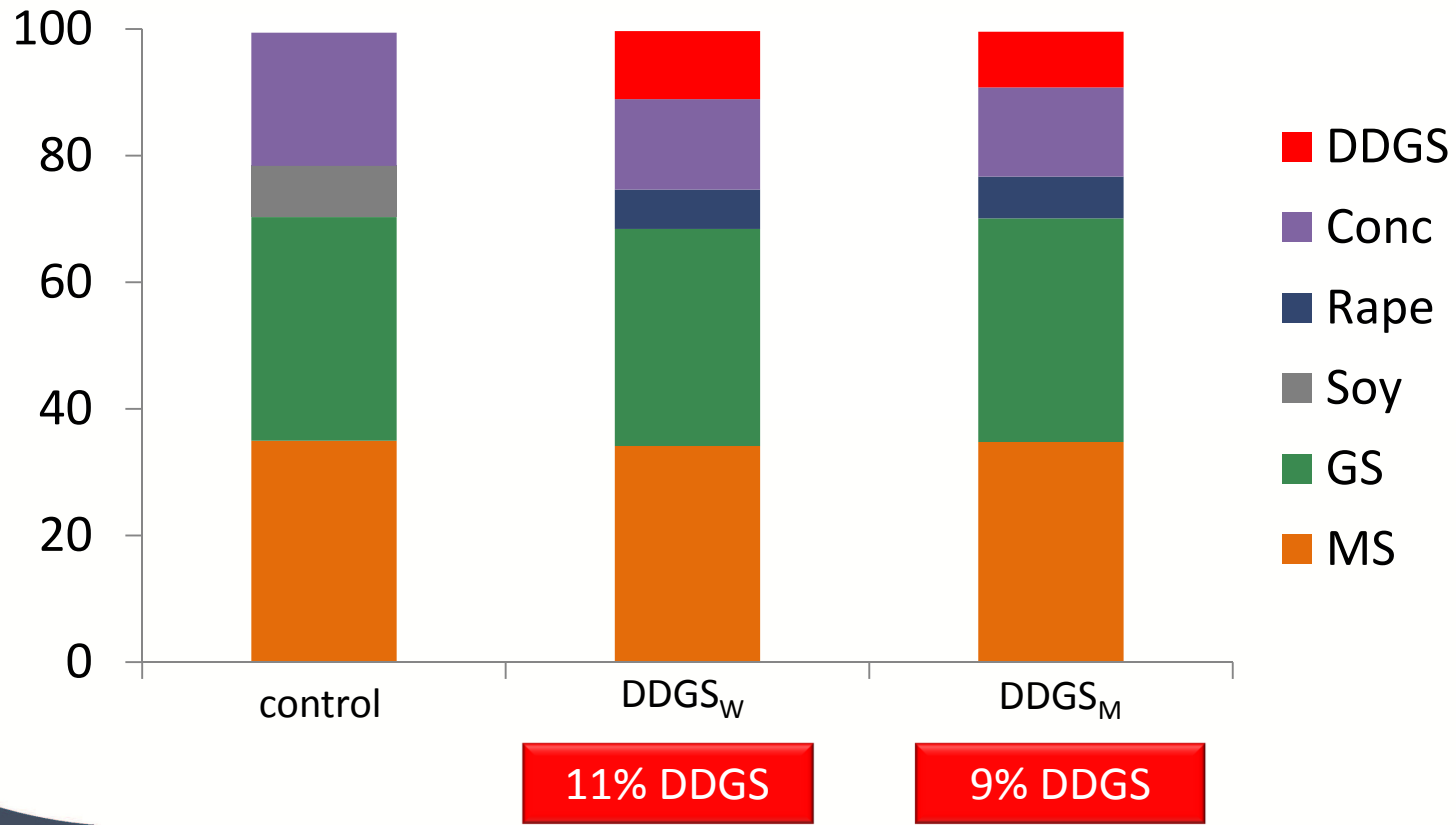
RESULTS

3. Wheat DDGS versus maize DDGS

Control	**$DDGS_W$**	**$DDGS_M$**
No DDGS	(100% wheat DDGS)	(100% maize DDGS)
	1 kg $DDGS_W$	0.87 kg $DDGS_M$
Soybean meal Rumen protected **soybean** meal	**Rapeseed** meal Rumen protected **rapeseed** meal	**Rapeseed** meal Rumen protected **rapeseed** meal

RESULTS

3. Wheat DDGS versus maize DDGS



RESULTS

3. Wheat DDGS versus maize DDGS

Feed intake and performances

	Control	$DDGS_W$	$DDGS_M$	P-value
DMI (kg/day)	**22.1** ± 0.6[a]	**23.0** ± 0.5[b]	**22.3** ± 0.5[a]	**<0.001**
MP (kg/day)	**31.5** ± 0.8 [a]	**33.2** ± 1.0 [b]	**32.8** ± 1.0 [b]	**<0.001**
Fat (%)	**4.22** ± 0.07	**4.14** ± 0.07	**4.12** ± 0.08	0.11
Protein (%)	**3.27** ± 0.03 [a]	**3.33** ± 0.03 [b]	**3.29** ± 0.03 [ab]	**<0.001**

RESULTS

3. Wheat DDGS versus maize DDGS

Feed intake and performances

	Control	$DDGS_W$	$DDGS_M$	P-value
DMI (kg/day)	**22.1** ± 0.6^{a}	**23.0** ± 0.5^{b}	**22.3** ± 0.5^{a}	**<0.001**
MP (kg/day)	**31.5** ± 0.8 ^{a}	**33.2** ± 1.0 ^{b}	**32.8** ± 1.0 ^{b}	**<0.001**
Fat (%)	**4.22** ± 0.07	**4.14** ± 0.07	**4.12** ± 0.08	0.11
Protein (%)	**3.27** ± 0.03 ^{a}	**3.33** ± 0.03 ^{b}	**3.29** ± 0.03 ^{ab}	**<0.001**
Fat prod (g/day)	**1329** ± 40	**1369** ± 40	**1342** ± 39	<0.05
Prot prod (g/day)	**1030** ± 29 ^{a}	**1105** ± 34 ^{b}	**1083** ± 36 ^{b}	**<0.001**
Milk urea (mg/L)	**212** ± 6	**214** ± 6	**213** ± 5	<0.05
N-efficiency	**29.1** ± 0.3 ^{a}	**29.8** ± 0.3 ^{ab}	**30.1** ± 0.5 ^{b}	**<0.001**

DISCUSSION

- ✓ Zootechnical performances for **DDGS** and **rumen protected soybean meal** comparable with control
- ✓ **Rumen protected soybean meal** reduces soybean meal use
- ✓ **DDGS** results in lower use of soybean meal and concentrates

DDGS & RUMEN PROTECTED SOYBEAN MEAL are valuable protein sources

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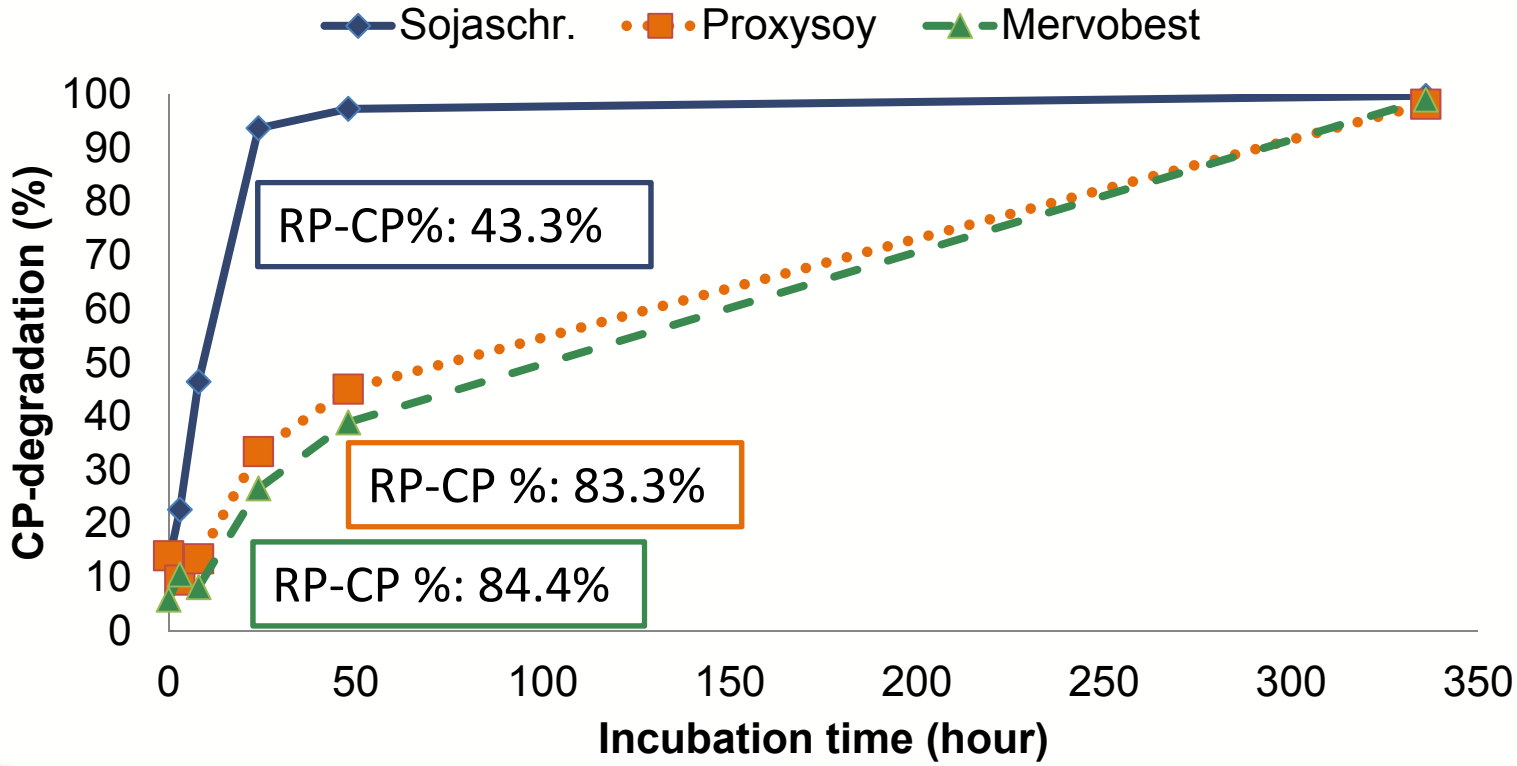
3. Rumen protected soybean meal

✓ Protection of CP in the rumen



RESULTS

1. Rumen protected soybean meal

✓ Diet composition

g/kg DM	Control	Heat treated	Form. treated
Crude protein	**150** ± 1.9	**148** ± 1.0	**147** ± 1.0
NDF	**345** ± 1.6	**356** ± 1.6	**350** ± 1.6
Crude fiber	**178** ± 1.3	**176** ± 1.3	**179** ± 1.4
NE_L (MJ/kg DM)	**7.0** ± 0.1	**6.9** ± 0.1	**6.9** ± 0.1
DPI_n	**85.6** ± 1.0	**86.6** ± 1.0	**85.7** ± 0.9
$RDPB_n$	**7** ± 1.2	**5** ± 0.5	**4** ± 0.4

RESULTS

2. DDGS at low and high dose

✓ Diet composition

g/kg DM	Control	Low dose DDGS	High dose DDGS
Crude protein	**147** ± 7	**149** ± 8	**153** ± 9
NDF	**344** ± 16	**359** ± 14	**367** ± 13
Crude fiber	**178** ± 9	**179** ± 8	**178** ± 9
NE_L (MJ/kg DM)	**6.8** ± 0.1	**6.8** ± 0.1	**6.8** ± 0.1
DPI_n	**88** ± 6	**87** ± 7	**89** ± 6
$RDPB_n$	**4.7** ± 2.8	**6.6** ± 2.6	**9.6** ± 3.0

RESULTS

3. Wheat DDGS versus maize DDGS

Diet composition

g/kg DM	Control	$DDGS_W$	$DDGS_M$
Crude protein	**158** ± 1.2	**156** ± 1.0	**157** ± 1.0
NDF	**370** ± 2.5	**379** ± 1.9	**391** ± 1.9
Crude fiber	**189** ± 1.5	**188** ± 1.3	**194** ± 1.2
Ether Extract	**24** ± 0.2	**27** ± 0.5	**34** ± 0.2
NE_L (MJ/kg DM)	**7.0** ± 0.1	**7.0** ± 0.1	**7.0** ± 0.1
DPI_n	**90.7** ± 1.08	**88.3** ± 0.77	**87.6** ± 0.68
$RDPB_n$	**7** ± 0.5	**6** ± 0.2	**7** ± 0.3