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Amino acid digestibility and energy concentration in soybean and rapeseed products fed to pigs

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Abstract 19168

Outline

- Background
- Digestibility experiments
  - Materials and Methods
  - Results
  - Conclusions
- Overall conclusions

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Soybean Products

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Soybean Meal

- **Premier protein source**
- **Excellent AA profile**
  - **high in Lys and Trp**
- **Antinutritional factors**
  - **→ Transient hypersensitivity response**

Enzyme-treated Soybean Meal

- Fermentation process
- Reduction of antigenic proteins
  - β-conglycinin
- Increased CP and AA

Goebel and Stein, 2011

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00-Rapeseed

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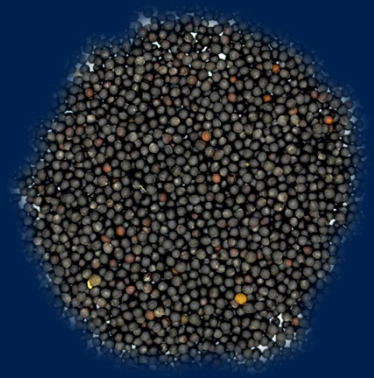
00-Rapeseed

- Low erucic and low glucosinolate varieties
- Desirable AA profile
  - Met and Cys
- Antinutritional factors
  - High fiber concentration



Test Ingredients

1. Enzyme-treated SBM (ESBM-1)
2. ESBM-2
3. Enzyme-fortified extruded SBM (SBM-EX)
4. Soy protein concentrate (SPC)
5. Conventional SBM (SBM-CV)
6. Conventional 00-rapeseed expellers (RSE)
7. Fermented co-product mixture (FCM)

Nutrient Composition, as-fed

	ESBM-1	ESBM-2	SBM-EX	SPC	SBM-CV	RSE	FCM
DM, %	92.0	91.2	92.9	91.7	88.7	88.6	87.1
CP, %	56.8	52.1	53.3	62.1	47.8	30.1	32.0
AEE, %	1.8	0.7	1.8	1.0	1.2	10.2	4.3
NDF, %	9.2	9.5	12.7	19.7	7.8	24.5	22.9
GE, kcal/kg	4,555	4,380	4,454	4,499	4,140	4,533	4,154

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Exp. 1
Amino Acid Digestibility

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Objective

- **To determine the standardized ileal digestibility of AA in soybean products and 00-rapeseed co-products fed to weanling pigs.**

Materials & Methods

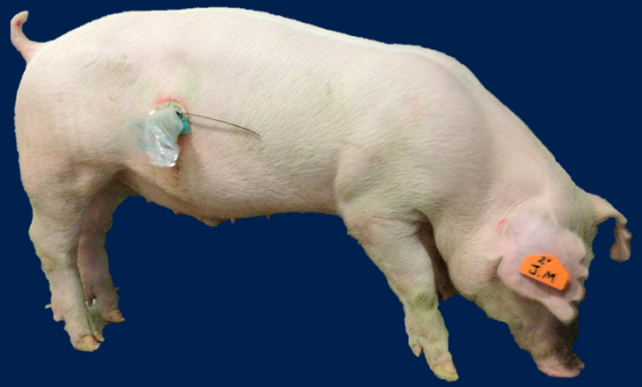
- 27 weanling barrows (initial BW: 9.29 ± 0.58 kg)
- 9 x 5 Youden square
  - 9 pigs per replicate and 3 replicates per period
  - 5 periods
  - 9 diets (7 ingredients and N-free)

Diet Composition

	ESBM-1	ESBM-2	SBM-EX	SPC	SBM-CV	RSE	FCM	N-free
ESBM-1	35.0	-	-	-	-	-	-	-
ESBM-2	-	35.0	-	-	-	-	-	-
SBM-EX	-	-	35.0	-	-	-	-	-
SPC	-	-	-	30.0	-	-	-	-
SBM-CV	-	-	-	-	40.0	-	-	-
RSE	-	-	-	-	-	40.0	-	-
FCM	-	-	-	-	-	-	40.0	-
Soybean oil	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0
Cornstarch	38.6	38.6	38.6	43.6	33.6	33.9	33.9	67.5
Sucrose	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Others	3.4	3.4	3.4	3.4	3.4	3.1	3.1	8.5

Materials & Methods

- SID of AA was calculated
- Statistical analysis
  - Proc Mixed of SAS
  - Fixed effect
    - Diet
  - Random effect
    - Pig and period



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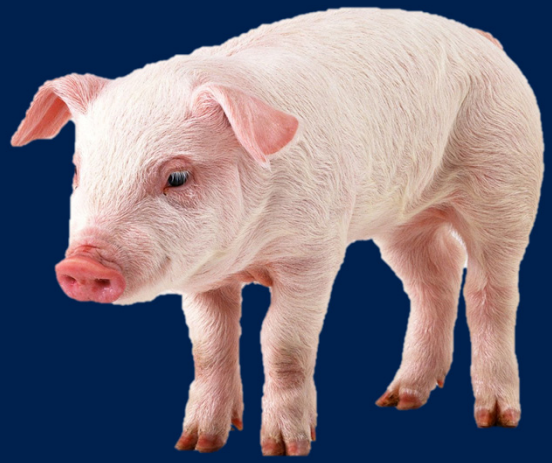
Results



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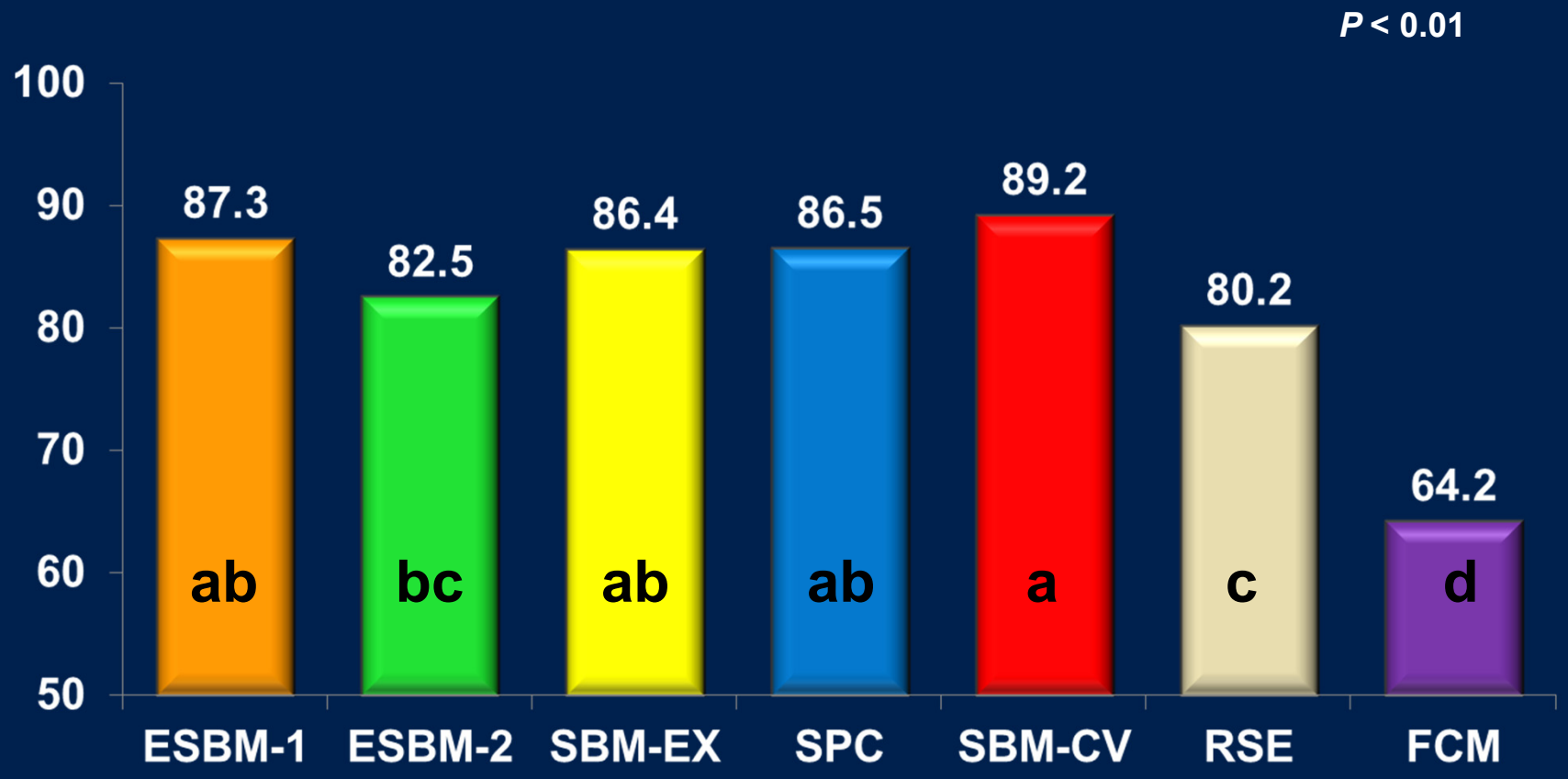
SID of Lys, %



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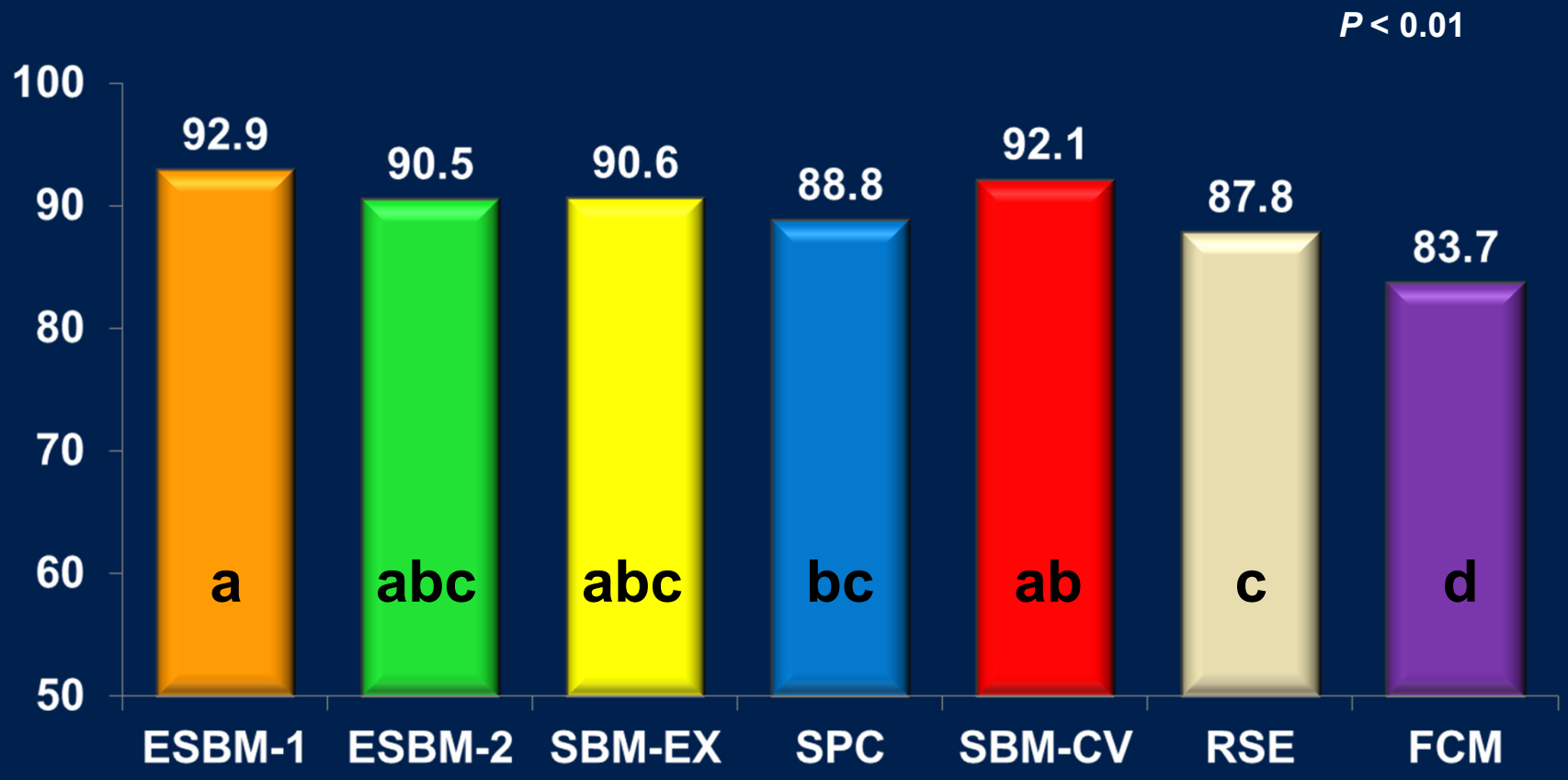
SID of Met, %



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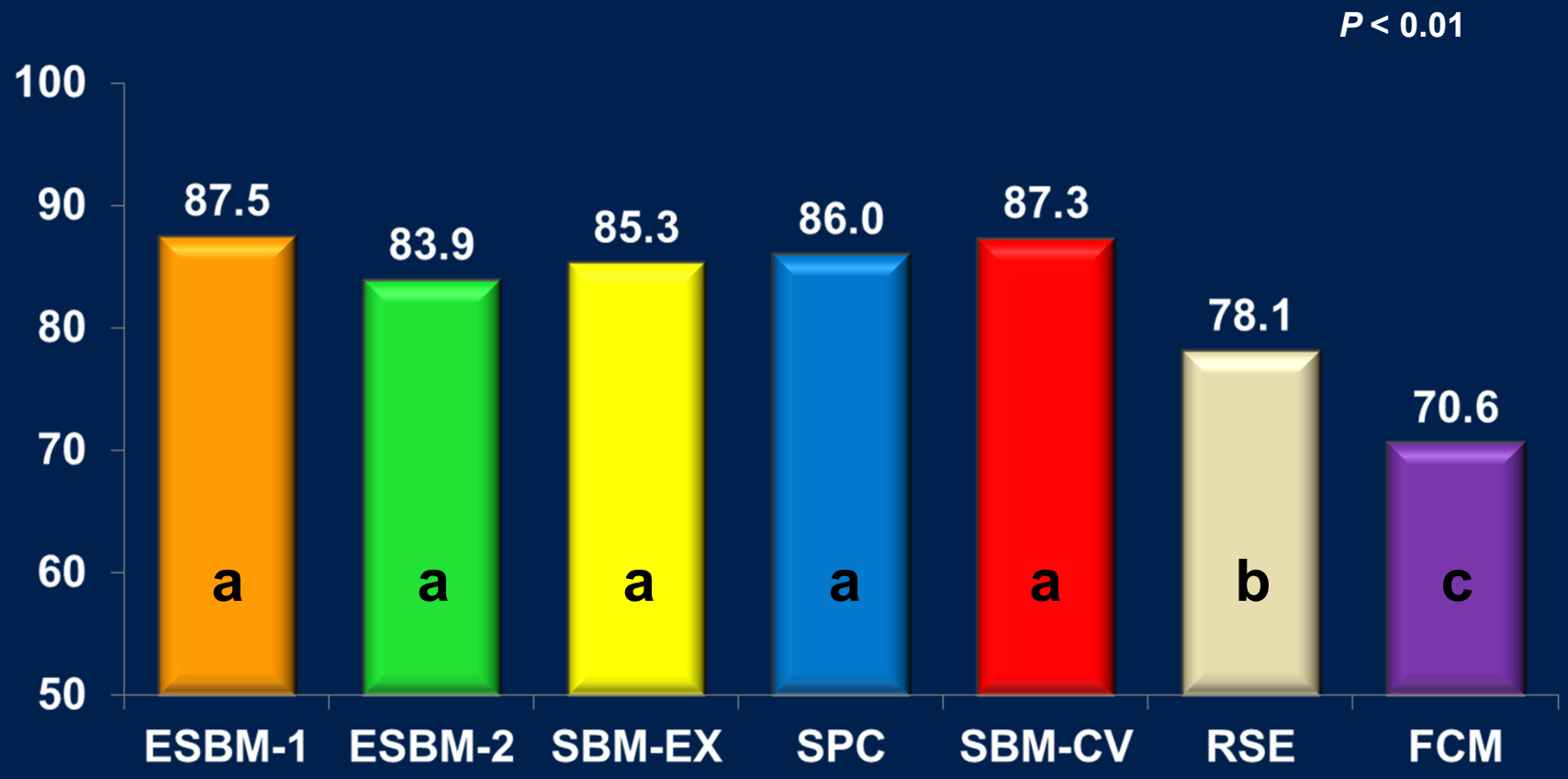
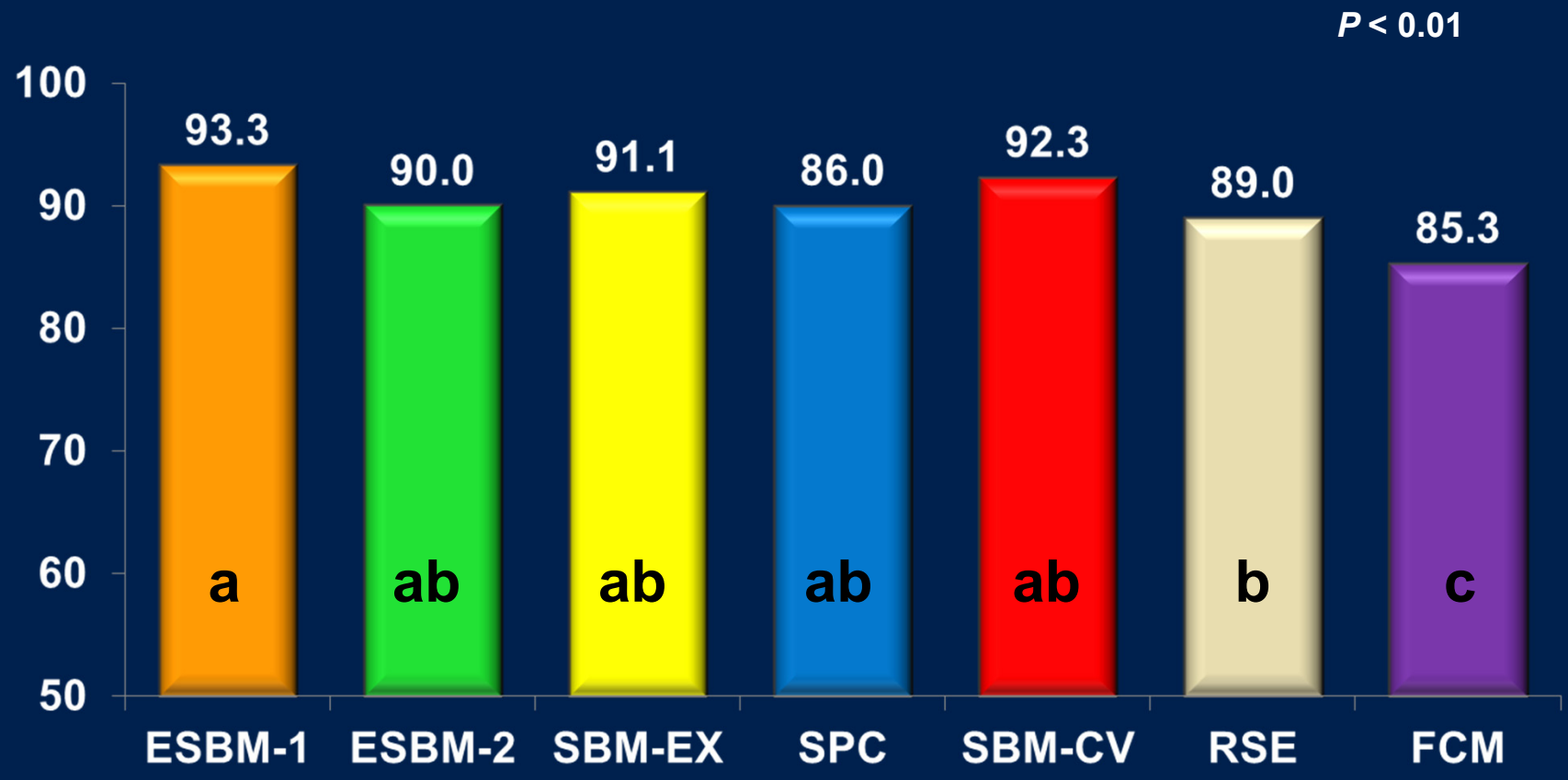
SID of Thr, %



SID of Trp, %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100
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80
70
60
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93.3
90.0
91.1
86.0
92.3
89.0
85.3
a
ab
ab
ab
ab
b
c
ESBM-1
ESBM-2
SBM-EX
SPC
SBM-CV
RSE
FCM

Conclusions

- Processing of SBM results in increased CP concentration and does not change AA digestibility.
- The SID of AA was different among processed soybean products.
- Fermentation of a co-product mixture results in decreased SID values compared with unfermented 00-rapeseed expellers and soybean products.

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Exp. 2
Energy Concentration

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Objective

- To determine the concentrations of DE and ME in soybean products and 00-rapeseed co-products fed to growing pigs.

Materials & Methods

- 64 barrows (initial BW: 19.81 ± 0.90 kg)
- RCBD
  - 8 treatments with 8 replicates per treatment
- Difference procedure

Diet Composition

	Corn	ESBM-1	ESBM-2	SBM-EX	SPC	SBM-CV	RSE	FCM
Corn	96.7	76.0	73.8	74.3	78.0	71.3	62.6	62.4
ESBM-1	-	21.0	-	-	-	-	-	-
ESBM-2	-	-	23.3	-	-	-	-	-
SBM-EX	-	-	-	22.8	-	-	-	-
SPC	-	-	-	-	19.0	-	-	-
SBM-CV	-	-	-	-	-	25.8	-	-
RSE	-	-	-	-	-	-	35.0	-
FCM	-	-	-	-	-	-	-	35.0
Others	3.3	3.0	2.9	2.9	3.0	2.9	2.4	2.6

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Results

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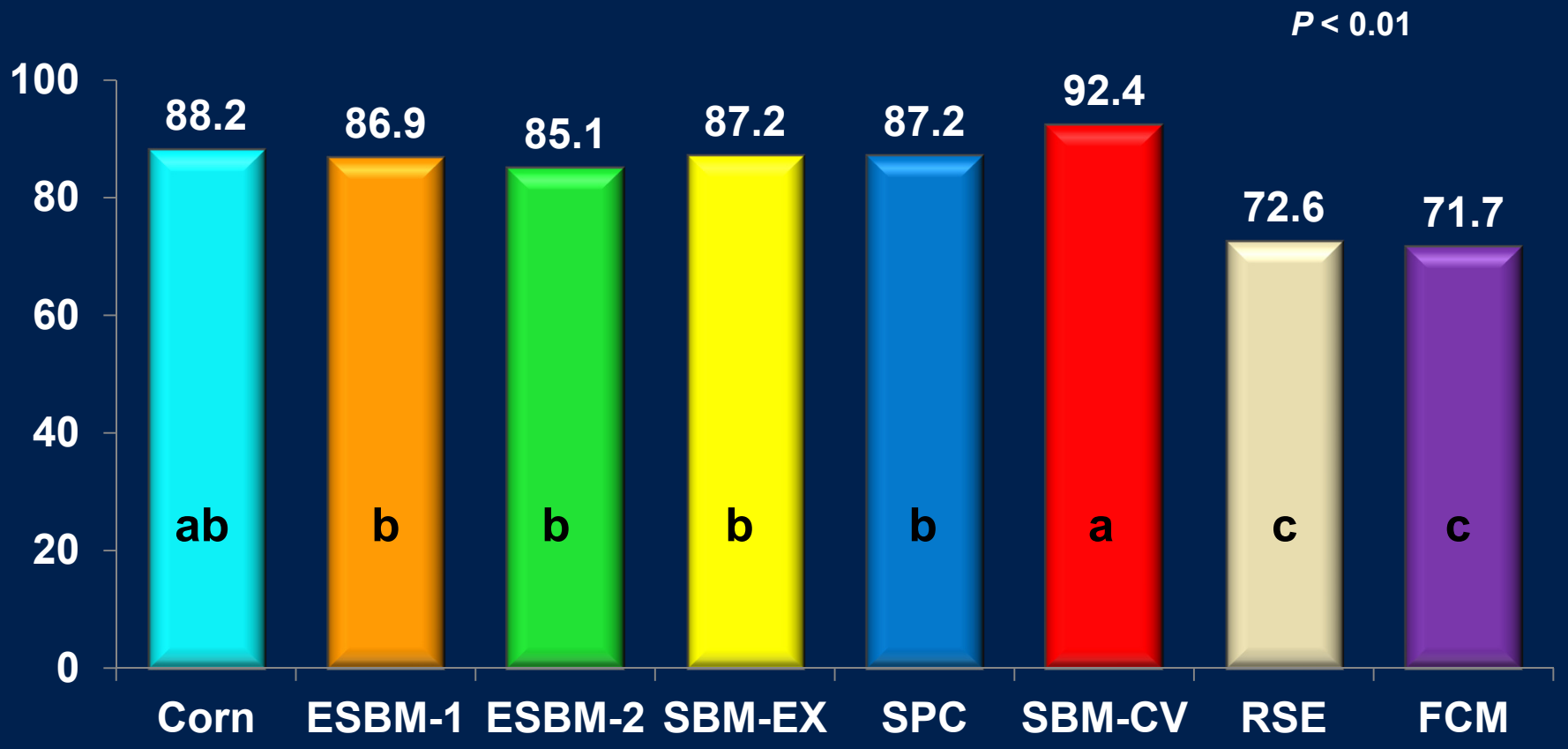
ATTD of GE, %



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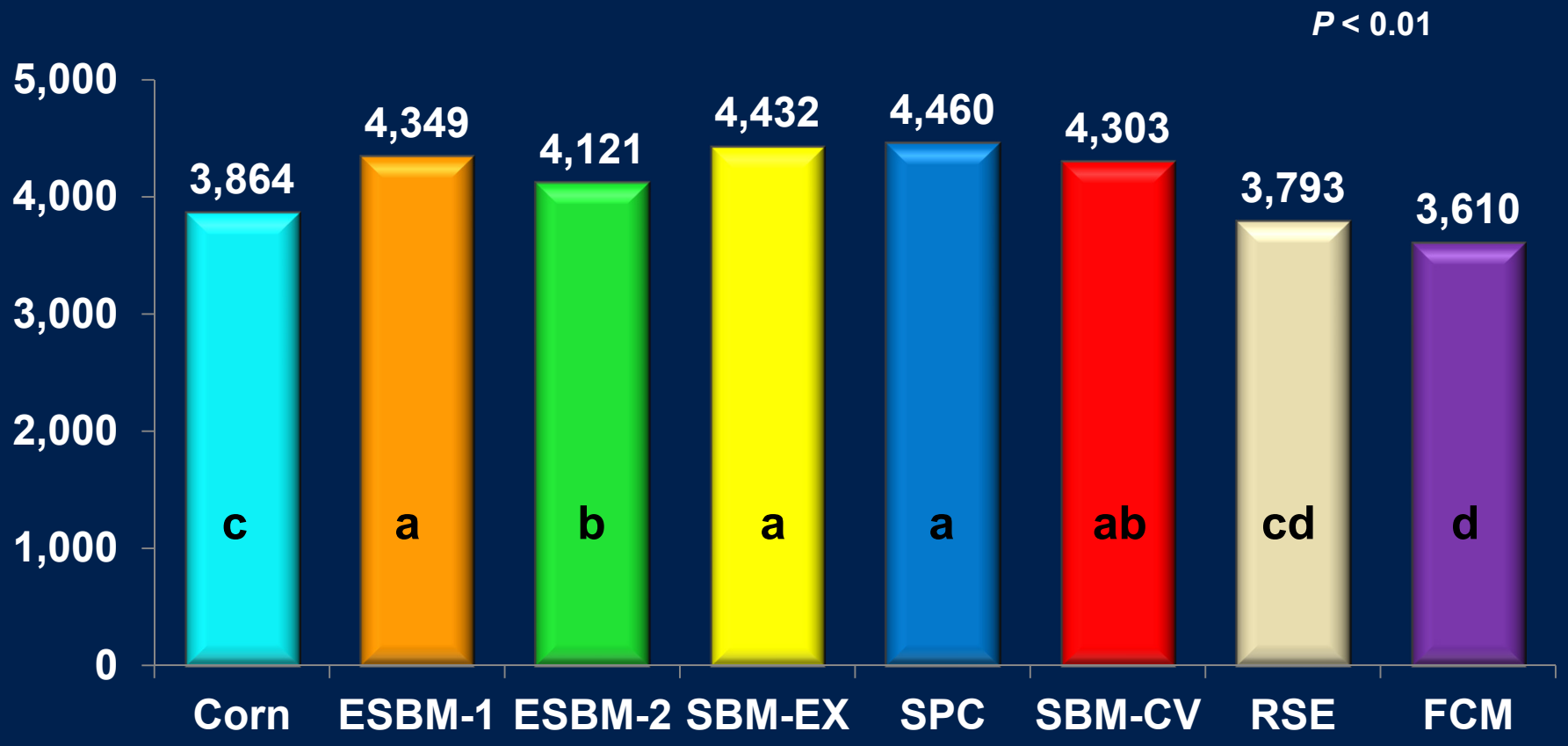
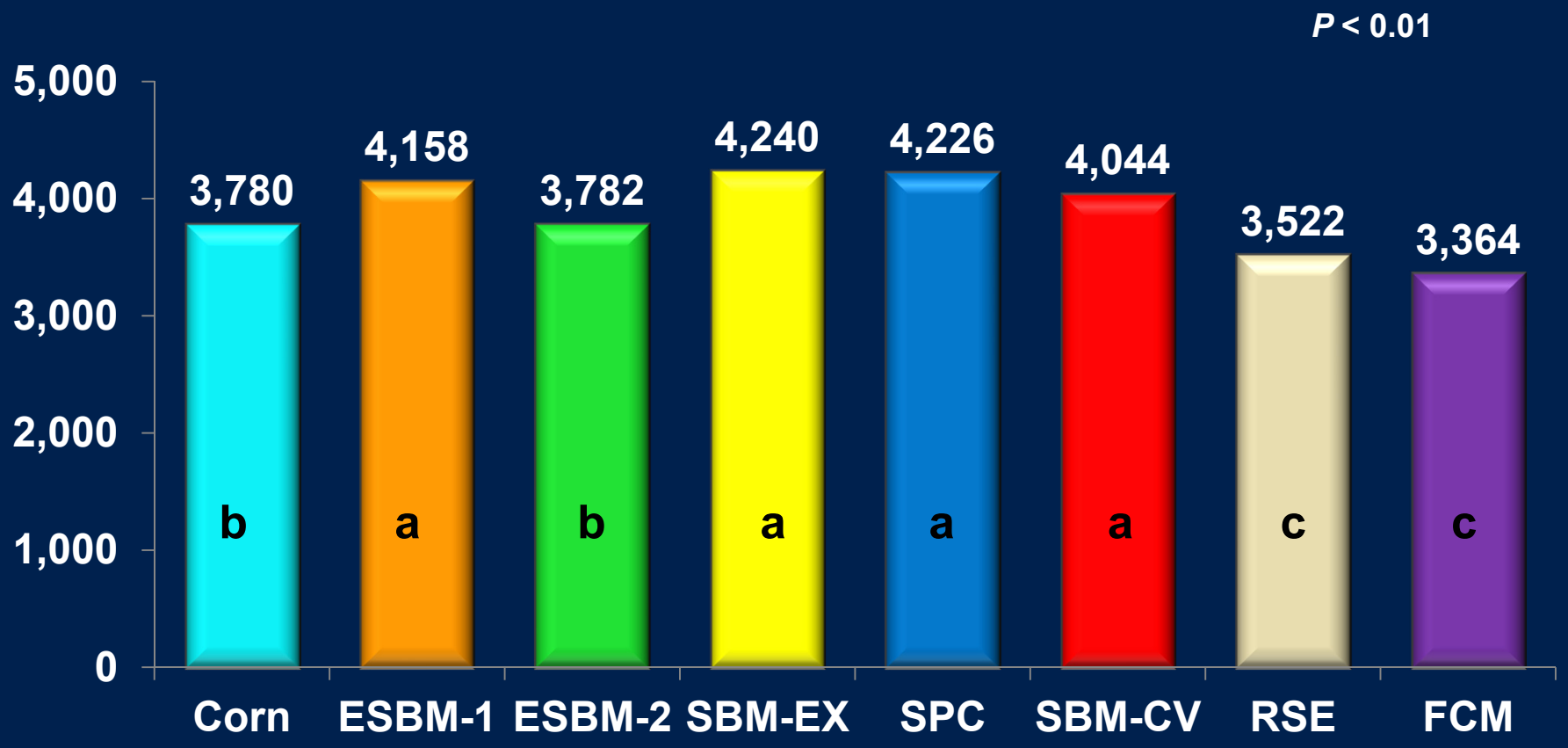
DE of ingredients, kcal/kg DM



ME of ingredients, kcal/kg DM



Conclusions

- DE and ME were different among processed soybean products.
- DE and ME in the soybean products were greater than in 00-rapeseed expellers and the fermented co-product mixture.

Overall Conclusions

- The process used to produce ESBM-2 was less efficient compared with ESBM-1.
- Fermentation of a co-product mixture results in decreased SID of AA, DE, and ME.

Acknowledgements

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http://nutrition.ansci.illinois.edu

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