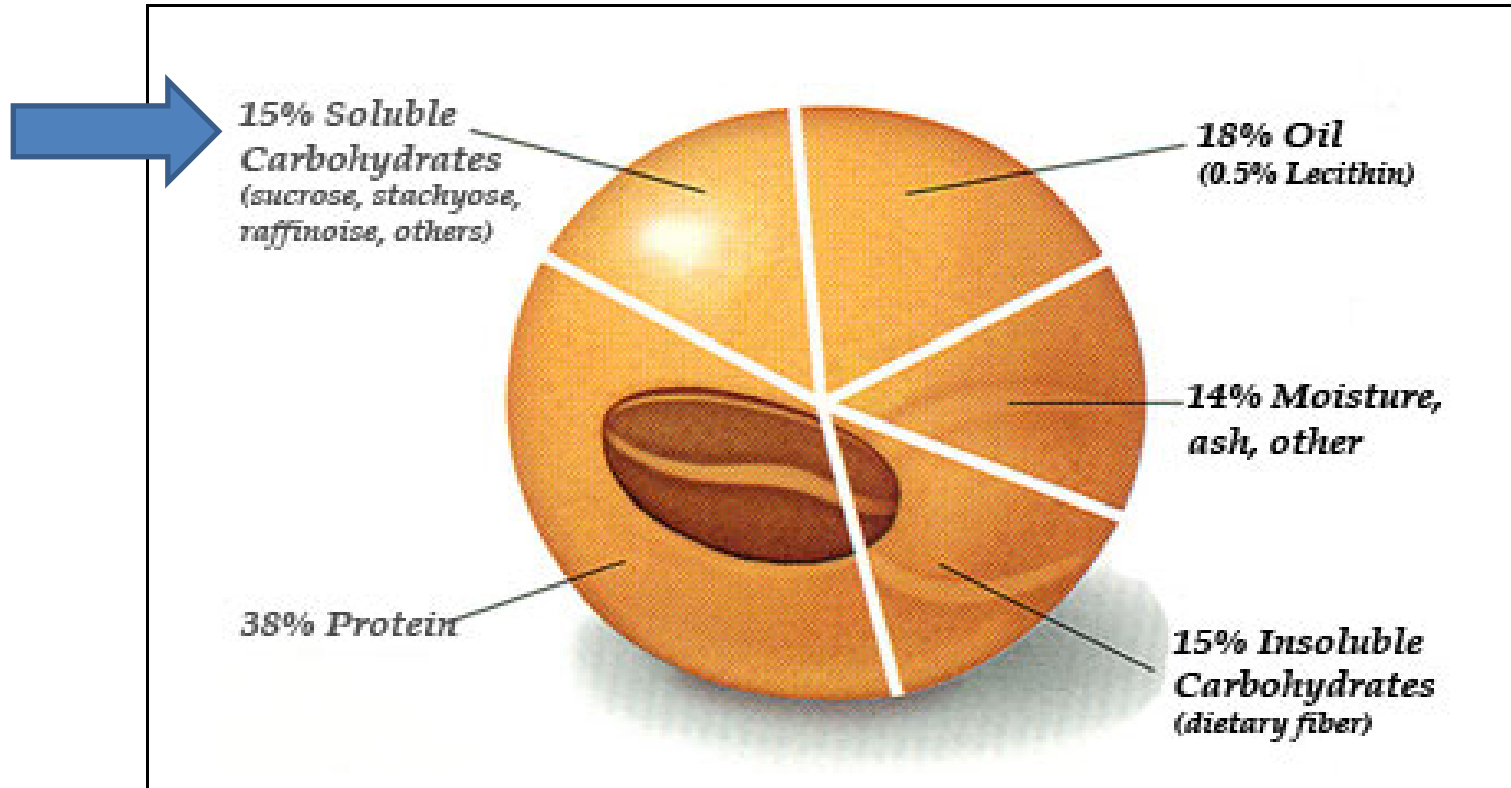




**Uniquely High Quality Soy-Protein**

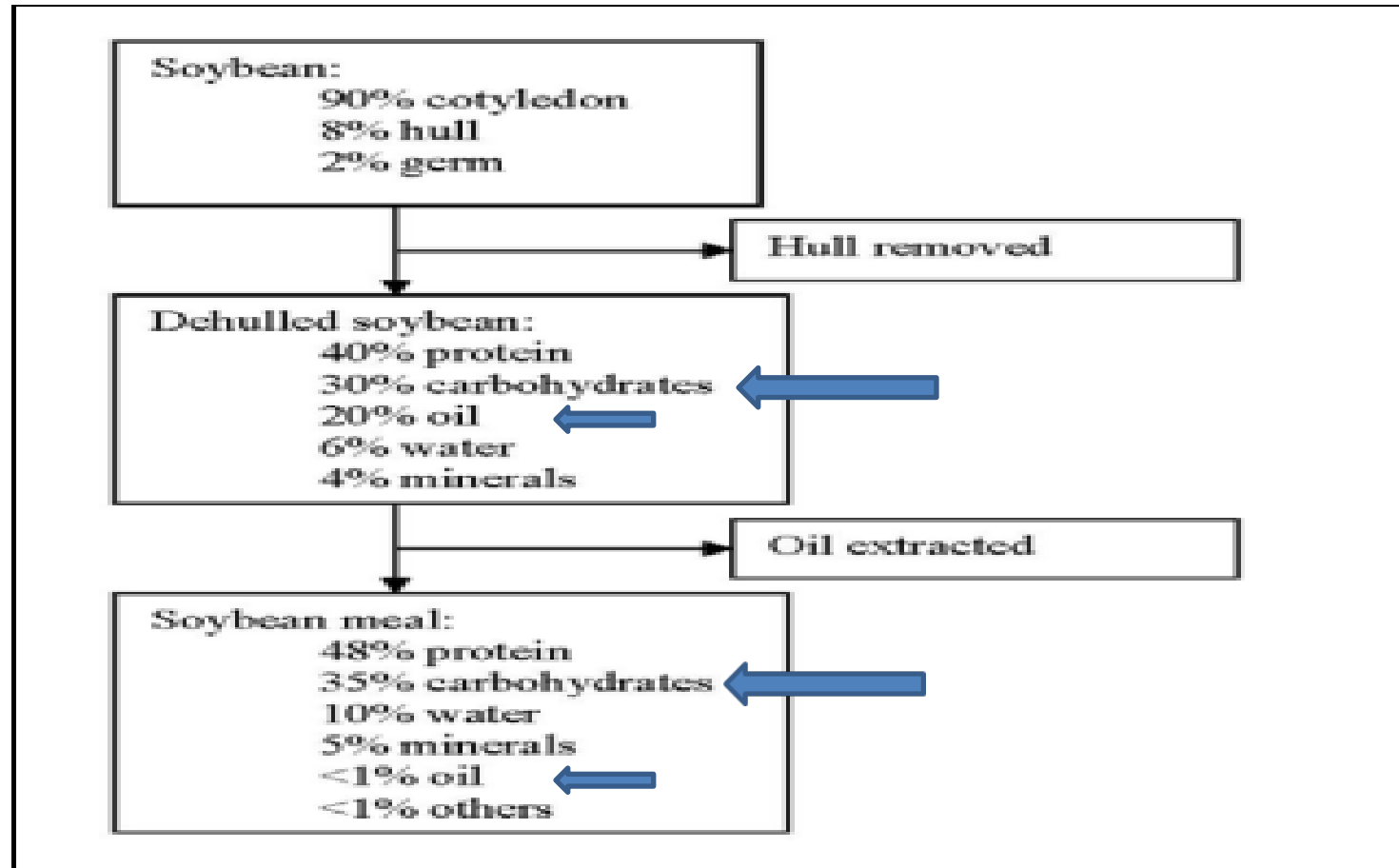
**Midwest-Ag Enterprises, Inc.**  
**Minnesota, USA**

# Composition of Soybean



# Soybean & Soybean Meal

## (Nutrient Composition)



# Anti-Nutritional Factors

Compounds that interfere with the intake, availability, or metabolism of nutrients in the animal

- **Protease inhibitors:** At least 5 trypsin inhibitors identified: Kunitz factor (1.4%) & Bowman-Birk factor (0.6%) which resistant to action of heat, alkali and acid
- **Lectins:** Glycoproteins noted for capability to agglutinate erythrocytes and bind sugar components (10-200 ppm)
- **Goitrogenic factors:** Glycosides belonging to the isoflavinic group, some of which like genistin; have goitrogenic activity
- **Saponins:** Although they appear in low levels they can decrease feed palatability (0.6%)
- **Phytic acid:** Phytates (1.0-2.3%) complexes with certain minerals ( Ca, P, Mg, Cu, Fe and Zn) & amino acids - reducing their bioavailability

# Anti-Nutritional Factors

Compounds that interfere with the intake, availability, or metabolism of nutrients in the animal

- **Oligosaccharides:** a saccharide polymer containing a small number (typically two to ten) of component sugars, also known as simple sugars; a flatulence factor in GIT of animals & interfering nutrient utilization
  - Raffinose (0.5-1.0%)
  - Stachyose (4.5-7.0%)
- **Glycinin:** Antigenic factor (66,000 ppm)
- **β-Conglycinin:** Antigenic factor (16,000 ppm), considered as a factor causing diarrhea in piglets
- **Rachitogenic factors:** Genistin (0.10% of raw soybeans) which interfere with calcification of bone (turkeys are particularly sensitive)
- **β-galactomannans:** Increasing stress proteins (0.25%)

# Anti-Nutritional Factors

Compounds that interfere with the intake, availability, or metabolism of nutrients in the animal

- 1) **Heat-labile ANFs:** Proper processing of soybeans requires precise control of moisture, temperature and processing time to destroy most of anti-nutritional factors. Both over and under-toasting of soybeans can result in a meal of lower nutritional quality
  - **Under-heating** produces incomplete removal of the anti-nutritional factors, while
  - **Over-toasting** can reduce digestibility of protein & amino acids (particularly lysine)
- 2) **Oligosaccharides** are still remaining in the processed meal until they are denatured or removed by a special process

# Analysis of SBM from Different Cultivars

| <b>Components</b> | <b>SBM</b> | <b>LO-SBM*</b> | <b>Diff</b> |
|-------------------|------------|----------------|-------------|
| • CP              | 47.7%      | 54.7%          | 7.0%        |
| • Sucrose         | 6.95%      | 8.38%          | 1.43%       |
| • Raffinose       | 0.71%      | 0.21%          | -0.5%       |
| • Stachyose       | 6.79%      | 1.56%          | -5.23%      |
| • Starch          | 0.89%      | 1.24%          | 0.35%       |
| • ADF             | 5.54%      | 3.52%          | -2.02%      |
| • NDF             | 8.09%      | 4.60%          | -3.49%      |
| • Cellulose       | 5.53%      | 3.74%          | -1.79%      |

\* Low oligosaccharides SBM

Perryman, K.R. & Co-workers,  
Int'l Poultry Expo, 2011



# Experiment 1. Apparent Metabolizable Energy (nitrogen corrected)

- 1,284 Ross broilers on 48 pens (16 replicates per treatment) for period of 18-32 days of age
- **AME<sub>n</sub> (Kcal/kg)**
  - SBM 2,241
  - LO-SBM 2,435 (+194 meaning **+8.7% AME**)

Perryman, K.R. & Co-workers,  
Int'l Poultry Expo, 2011





## Experiment 2. Amino Acid SID Coefficient

- 2,996 Ross broilers on 24 pens (12 replicates per treatment) for period of 18-32 days of age to test digestibility of SBM & LO-SBM at 43% in test diets
- **Standardized Ileal Digestible AA Coefficient (%)**
  - Met, Lys, Thr, Val, and Ile: SBM<LO-SBM ( $P<0.001$ )
- **Analytical value of Met, Lys, Val, and Ile**
  - 0.02-0.03% higher in LO\_SBM

Perryman, K.R. & Co-workers,  
Int'l Poultry Expo, 2011



# What is NutriVance?

- A novel raw material derived from SBM by a special process technology (manufacture started @Midwest-USA in 2012)
- A protein concentrate of superb nutritional quality for piglets, young animals and marine fish/shrimp since it contains very low levels of oligosaccharides and heat-labile ANFs



# Features of NutriVance

- 1) A unique proprietary process which has combined the oil extraction with enzymatic treatment of soybeans
- 2) The special process rendered a soy-protein that has superior palatability and digestibility for young animals to conventionally-produced soybean meal
  - Low in anti-nutritional factors (TIA, oligosaccharides, etc.)
  - Micronized particle size to maximize surface area
- 3) Concentrated protein: CP  $\geq$  60% (typically over 63%)
- 4) Excellent alternative for fish meal, dairy product, SPC or fermented soy-proteins in diets for piglets, young animals, breeding stocks, concentrate feed, aqua-feed



# Trypsin Inhibitor and Oligosaccharides

| Soy Protein Sources | CP (%) | TIA (mg/g) | Stachyose (%) | Raffinose (%) |
|---------------------|--------|------------|---------------|---------------|
| SBM (47)            | 47     | 4-8        | 4-4.5         | 0.8-1.0       |
| NutriVance          | 60     | 2.31       | 0.5           | 0.2           |
| SPC                 | 65     | 2-3        | 1-3           | <0.2          |
| HP300               | 53     | 2-3        | <0.5          | <0.1          |

- ✓ Stachyose and raffinose are the major oligosaccharides that cause the symptom of flatulence in the lower GIT
- ✓ NutriVance contains very low level of stachyose and raffinose as well as lower TIA level than SBM

# **Trial I: Effect of Nutrivance on Nursery Pig Performance**

**University of Missouri**

**Dr. Gary Allee and Greg Gerlemann**

**(January 2012)**



- **Location:** Moberly, MO, Nursery Facility
- **Researchers In Charge:** Dr. Gary Allee and Greg Gerlemann

## Experimental Design

- **Animals:** 966 heads of PIC sired pigs;  
7 pens of 23 pigs per treatment
- **Dietary Treatments**
  - 1) Control (Fish meal)
  - 2) Dr. Allee's Treatment
  - 3) HP 300
  - 4) NutriVance
  - 5) NutriVanceE
  - 6) PepSoyGen



## Experimental Design (continued)

- **Duration:** Started 1<sup>st</sup> week of January 2012 and then finished 42 days post-placement
  - Phase 1: 0-7 day
  - Phase 2: 8-21 day
  - Phase 3: 22-42 day (common feed)
- **Measurements:**
  - Weighed at day 0, 7, 21 and 42 (pen base)
  - Measured feed intake for day 0, 7, 21 and 42 (pen base)
  - Recorded mortality/morbidity by pen & treatment
  - Kept records of treatment for sick pig by pen & treatment
- **Composition of Test Diets:**
  - As in Table

# Diets (phase I)

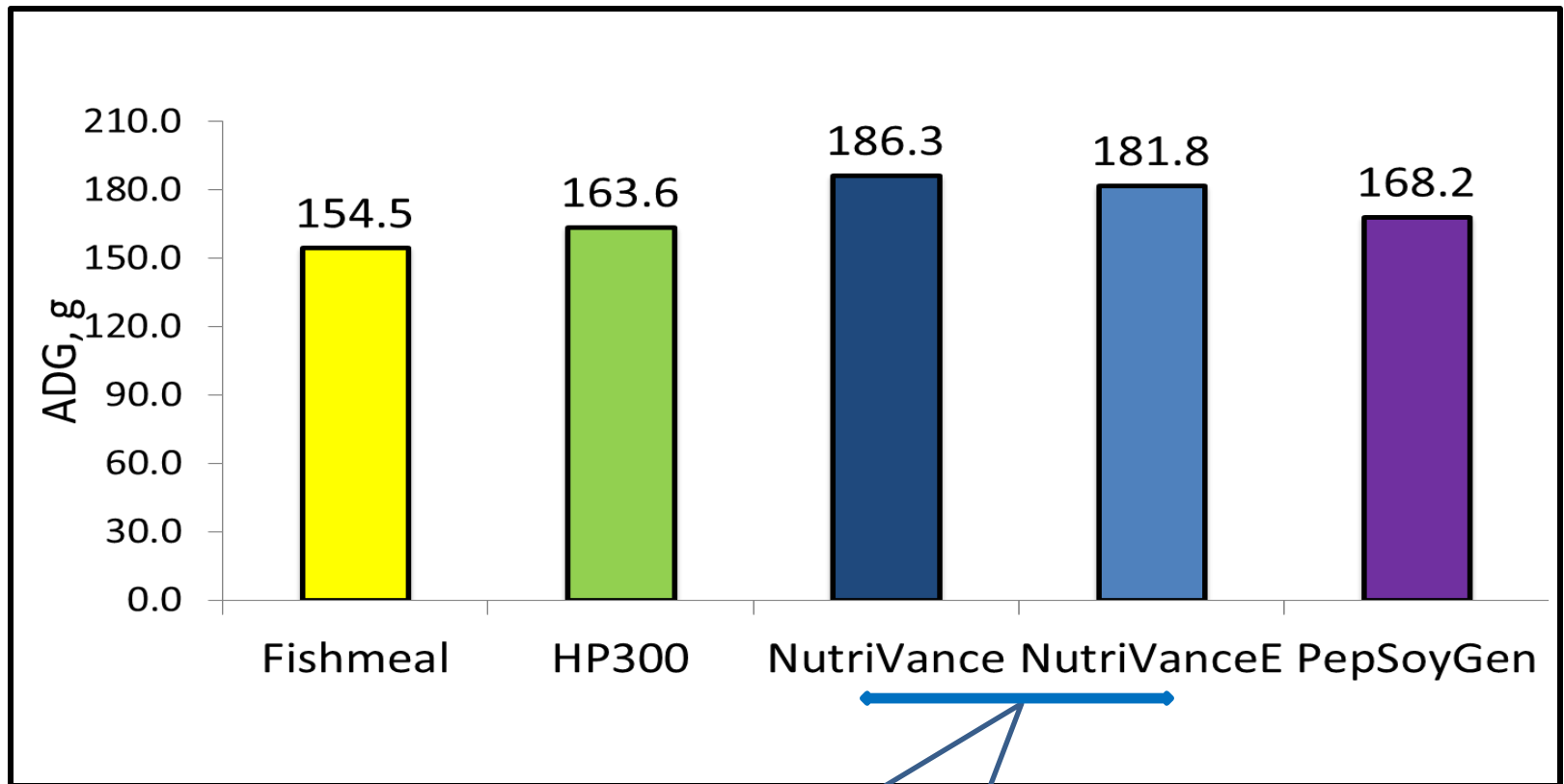
| INGREDIENTS       | FISH MEAL | HP 300      | NUTRIVANCE  | NUTRIVANCEE | PEPSOYGEN |
|-------------------|-----------|-------------|-------------|-------------|-----------|
| Corn              | 428.73    | 408.99      | 409.12      | 409.12      | 396.71    |
| SBM 48%           | 200       | 200         | 200         | 200         | 200       |
| Fat, CWG          | 30        | 30          | 30          | 30          | 30        |
| L-Lysine          | 2.45      | 3.2         | 3.3         | 3.3         | 3.33      |
| DL-Methionine     | 1.8       | 2.2         | 2.25        | 2.25        | 2.1       |
| L-Threonine       | 1.03      | 1.07        | 1.03        | 1.03        | 1.04      |
| L-Tryptophan      | 0         | 0           | 0           | 0           | 0.03      |
| Whey (IIC)        | 100       | 100         | 100         | 100         | 100       |
| Plasma (APC)      | 50        | 50          | 50          | 50          | 50        |
| DairyLac 80 (IIC) | 100       | 100         | 100         | 100         | 100       |
| Fish Meal         | 60        | 0           | 0           | 0           | 0         |
| <b>HP-300</b>     |           | <b>67.5</b> |             |             |           |
| <b>Nutrivance</b> |           |             | <b>67.5</b> |             |           |
| <b>NutrienceE</b> |           |             |             | <b>67.5</b> |           |
| <b>Pepsoygen</b>  |           |             |             |             | <b>80</b> |
| Total             | 1000      | 1000        | 1000        | 1000        | 1000      |
|                   |           |             |             |             |           |
| ME (Mcal/kg)      | 3.521     | 3.509       | 3.497       | 3.497       | 3.484     |
| CP (%)            | 22.04     | 22.05       | 22.34       | 22.34       | 22.43     |
| SID Lysine (%)    | 1.45      | 1.45        | 1.45        | 1.45        | 1.45      |



# Diets (phase II)

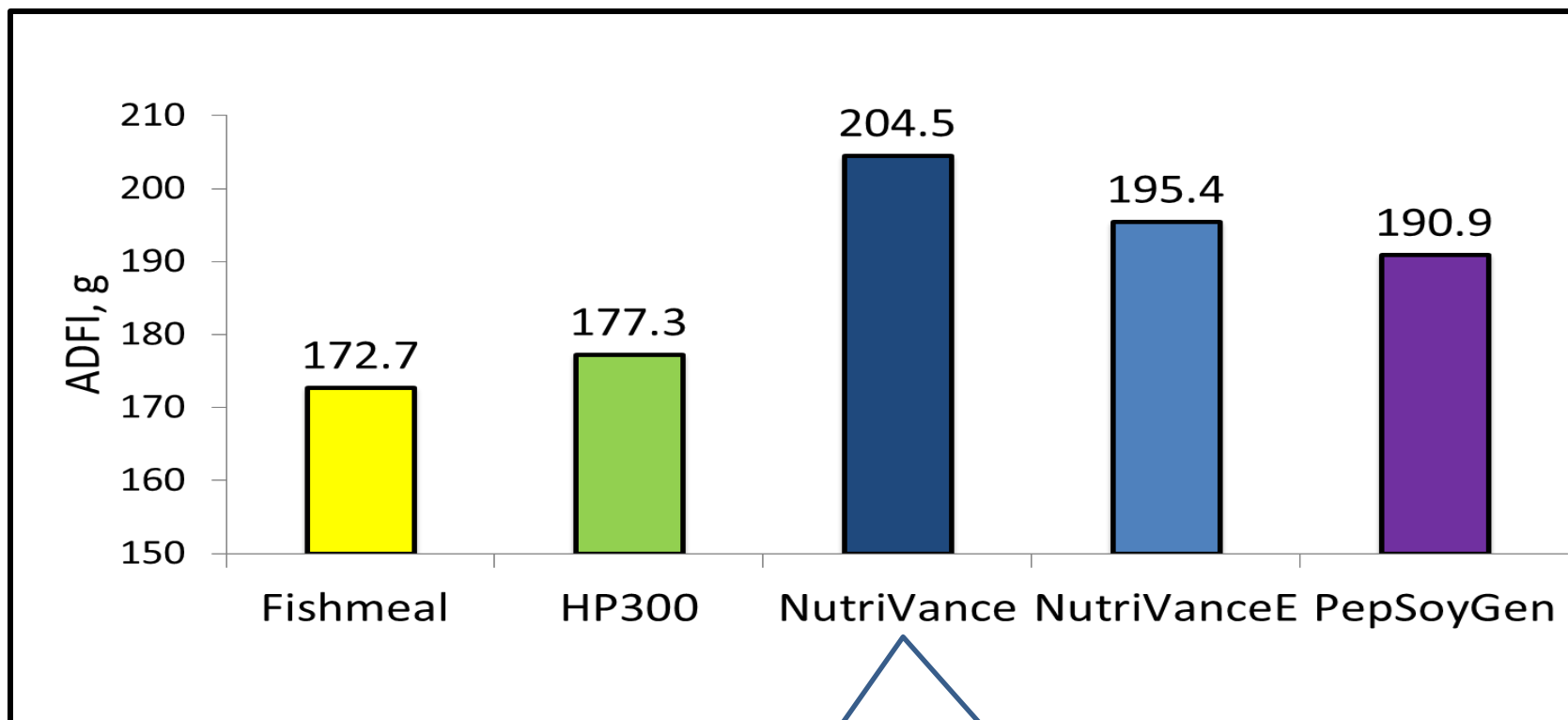
| INGREDIENTS        | CONTROL     | HP 300      | NUTRIENCE   | NUTRIENCEE  | PEPSOYGEN   |
|--------------------|-------------|-------------|-------------|-------------|-------------|
| Corn 2010          | 517.53      | 499.97      | 500.07      | 500.07      | 483.45      |
| SBM 48%            | 250         | 250         | 250         | 250         | 250         |
| Fat, CWG           | 30          | 30          | 30          | 30          | 30          |
| L-Lysine           | 3.1         | 3.65        | 3.75        | 3.75        | 3.55        |
| DL-Methionine      | 1.65        | 1.96        | 2           | 2           | 1.8         |
| L-Threonine        | 1.33        | 1.33        | 1.31        | 1.31        | 1.2         |
| Whey (IIC)         | 50          | 50          | 50          | 50          | 50          |
| Plasma (APC)       | 20          | 20          | 20          | 20          | 20          |
| DairyLac 80 (IIC)  | 50          | 50          | 50          | 50          | 50          |
| <b>Fish Meal</b>   | <b>50</b>   | <b>0</b>    | <b>0</b>    | <b>0</b>    | <b>0</b>    |
| <b>HP-300</b>      |             | <b>57.5</b> |             |             |             |
| <b>Nutrivence</b>  |             |             | <b>57.5</b> |             |             |
| <b>NutrivenceE</b> |             |             |             | <b>57.5</b> |             |
| <b>Pepsoygen</b>   |             |             |             |             | <b>75</b>   |
| Total              | 1000        | 1000        | 1000        | 1000        | 1000        |
| ME (Mcal/kg)       | 3.489       | 3.479       | 3.469       | 3.469       | 3.458       |
| CP (%)             | 21.21       | 21.27       | 21.52       | 21.52       | 21.88       |
| Total Lysine (%)   | 1.52        | 1.52        | 1.53        | 1.53        | 1.55        |
| TID Lysine (%)     | <b>1.38</b> | <b>1.38</b> | <b>1.38</b> | <b>1.38</b> | <b>1.38</b> |

## ADG d0-7 (g/d)



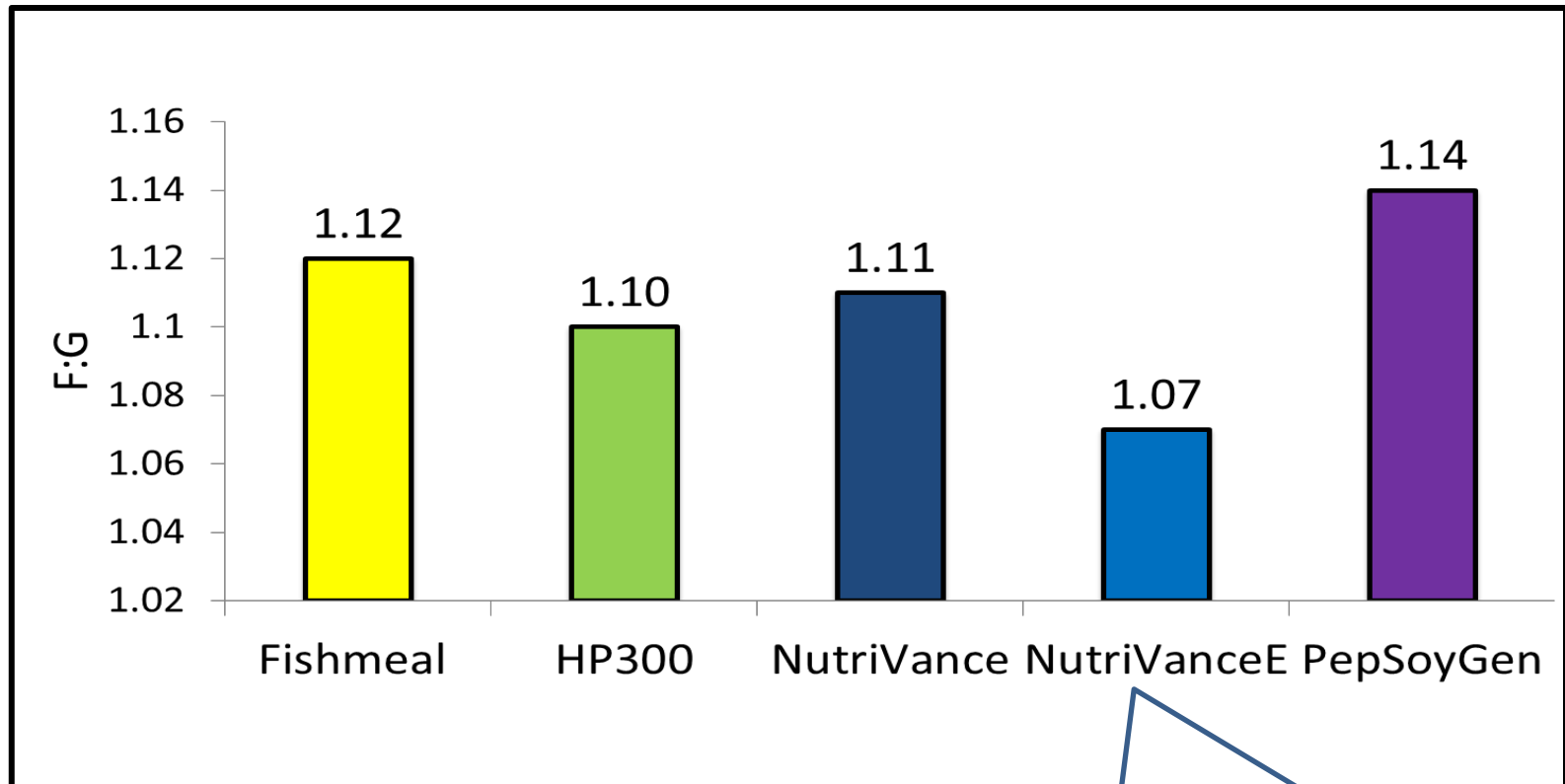
NutirVance showed 30 gr/d advantage over Fishmeal In the 1<sup>st</sup> Phase

## ADFI d0-7(g/d)



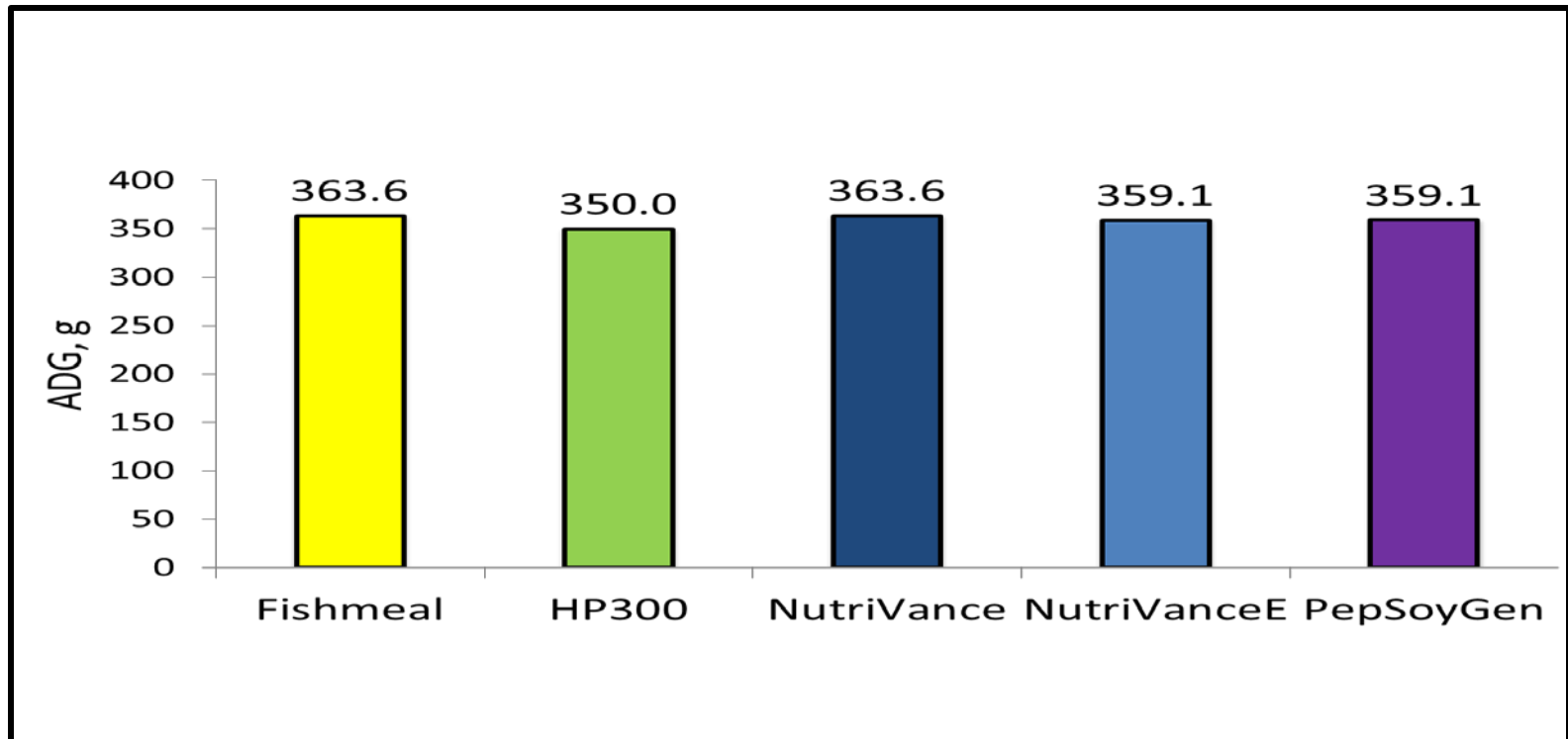
NutirVance showed an excellent palatability over the others in the 1<sup>st</sup> seven days of trial

## FCR d0-7



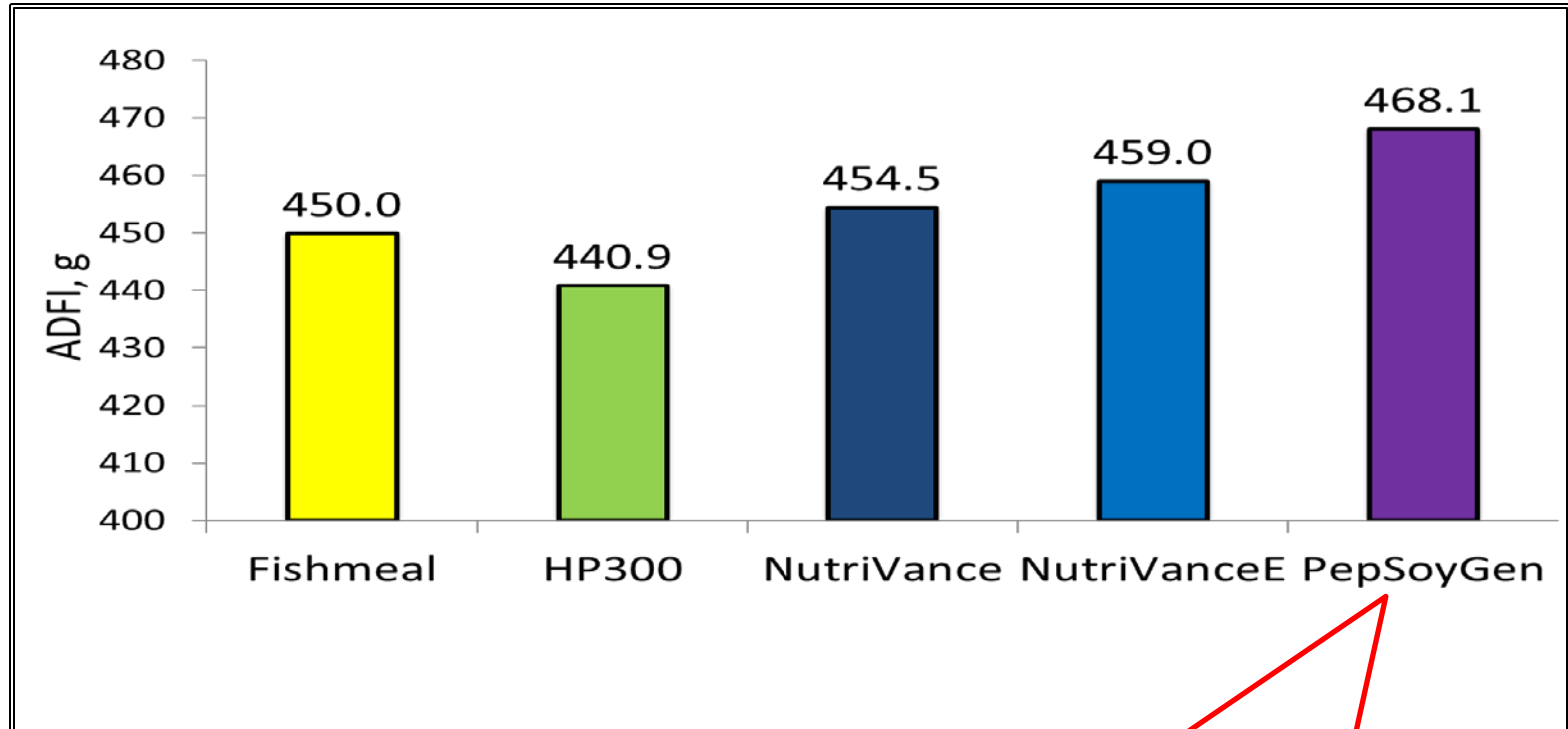
NutriVanceE showed the best Feed Efficiency over the others in the 1<sup>st</sup> seven days of trial

## ADG d8-21 (g/d)



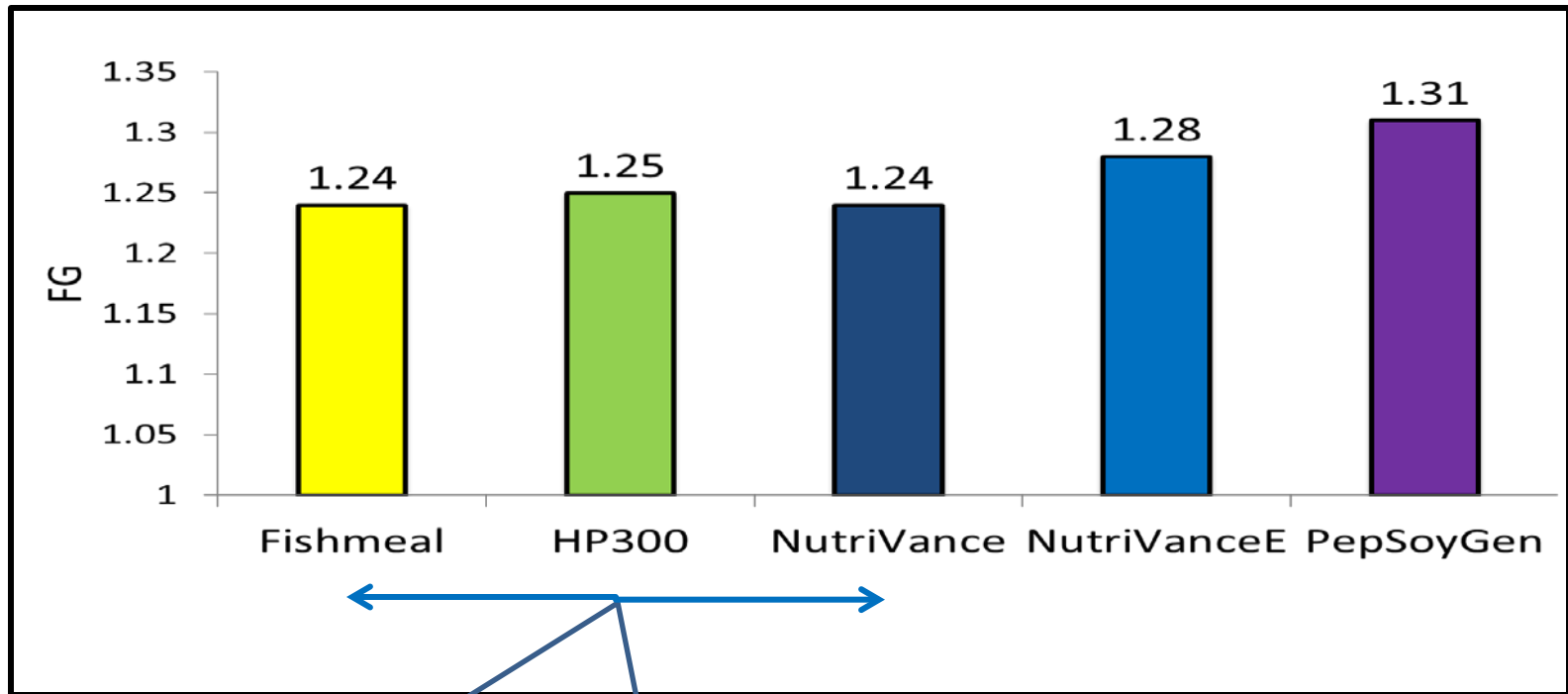
During the 2<sup>nd</sup> Phase, ADG appears to be similar between the protein sources

## ADFI d8-21(g/d)



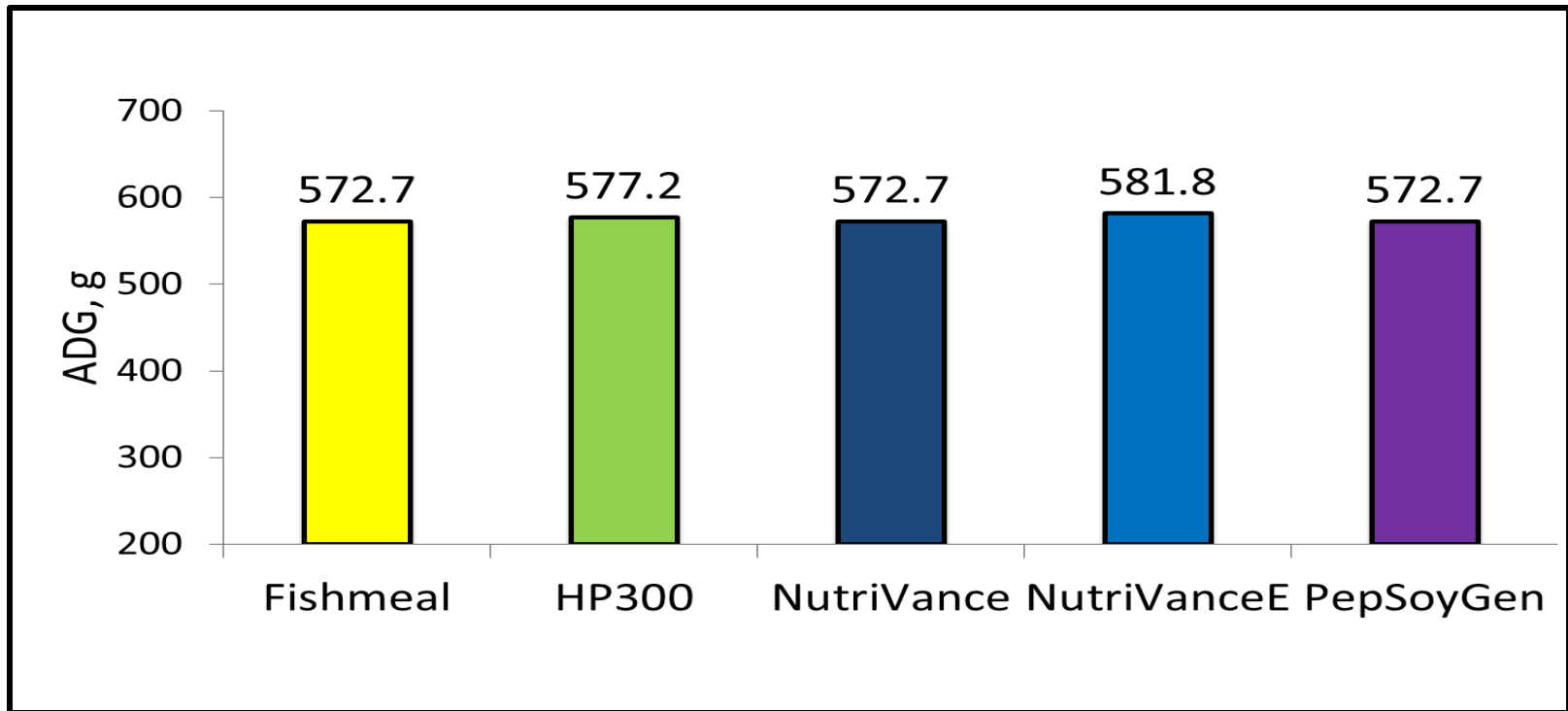
During the 2<sup>nd</sup> Phase, ADFI was higher in PepSoyGen group than others but with a similar daily-gain

## FCR d8-21



During the 2<sup>nd</sup> Phase, FCR was similar between Fishmeal, HP300 and NutriVance whereas NutriVanceE and PepSoyGen was a bit worse

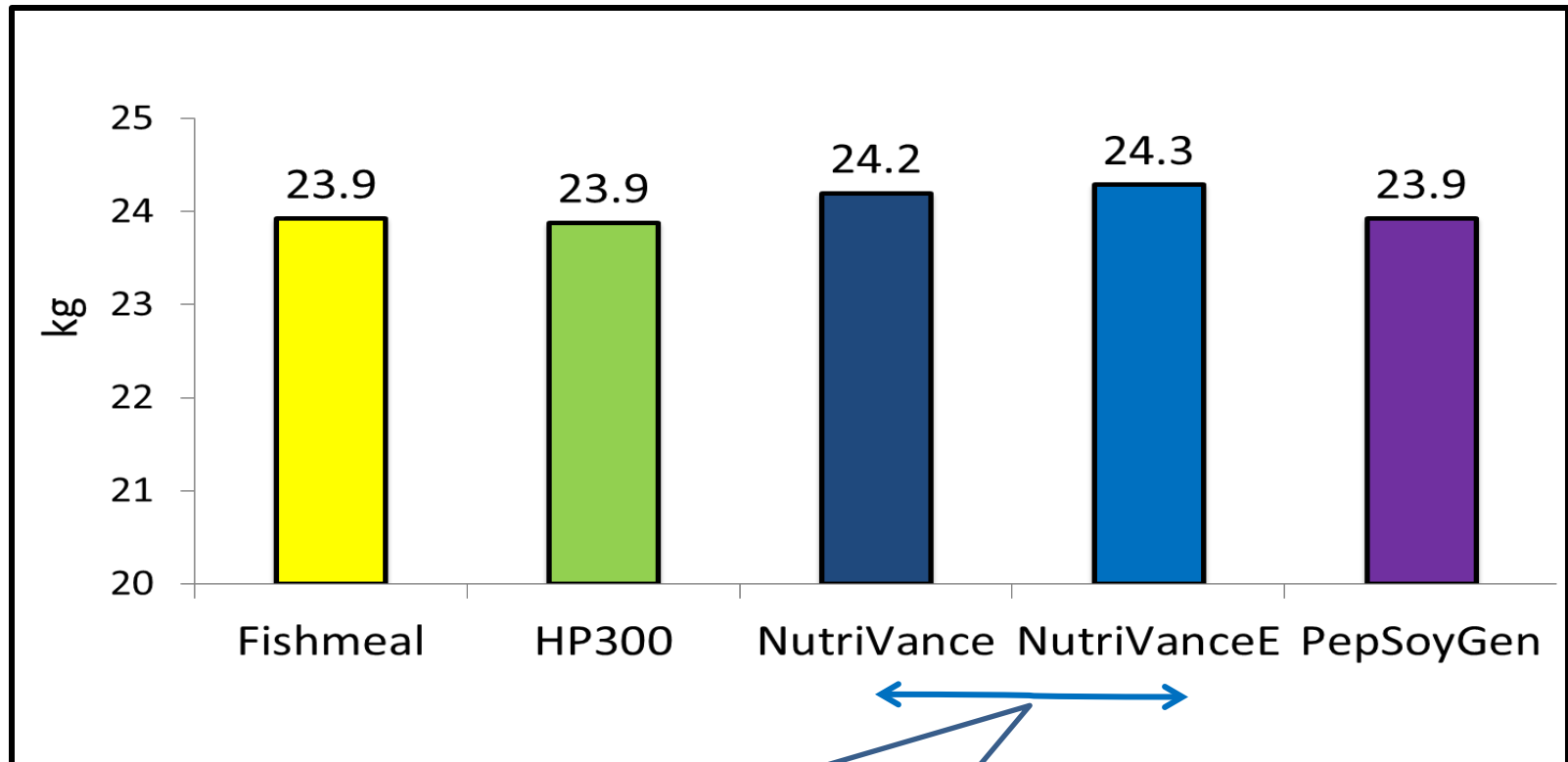
## ADG d22-42 (g/d)



During the 3<sup>rd</sup> Phase, ADG appears to be similar between the protein sources



## Final Body Weight (kg)



Body weight was slightly advantageous for NutriVance products after 42 days of feeding trial

# Summary (Trial I)

- 1) NutriVance had better ADG than other protein sources during the 1<sup>st</sup> Phase which was not sustained in the 2<sup>nd</sup> and 3<sup>rd</sup> Phase
- 2) Highest ADFI was recorded by NutriVance and followed by NutriVanceE and PepSoyGen
- 3) In the 2<sup>nd</sup> Phase, PepSoyGen resulted in the highest ADFI but ADG was not better than other proteins
  - ❖ Soy protein fermented in the hindgut may lead to surplus of ammonia and biogenic amines like tyramine and spermidine that may cause diarrhea and will negatively affect performance
- 4) In the 2<sup>nd</sup> Phase, PepSoyGen marked the worst FCR as with the highest ADFI but without support of ADG
- 5) During the 3<sup>rd</sup> Phase, ADG was similar among the trial groups since they are all fed the same common diet
- 6) At the end of trial, Final Body Weight was slightly better in the group of NutriVance, indicating the carryover of ADG obtained in the 1<sup>st</sup> Phase



# **Trial 2: Evaluation of a novel protein supplement (NutriVance) for early-weaned pigs**

*University of Minnesota*

*Dr. Sam Baidoo*



## **STUDY OBJECTIVES**

- 1) Evaluate the performance of piglets weaned at 18 days of age and fed diets containing various levels of a novel soy product (NutriVance), with a focus on the early nursery period
- 2) Compare the performance of nursery pigs fed NutriVance to those pigs fed the similar amount of commonly used high quality proteins such as fish meal or soy protein concentrate



# Experimental Design

- ***Location:***

Waseca, University of Minnesota Research Facility

- ***Animals:***

- ✓ Breeds: Compart x Topigs pigs

- ✓ 192 heads with mean body weight: 5.65+/-0.47 kg

- ✓ 8 pens of 4 pigs per treatment

- ***Dietary Treatments:***

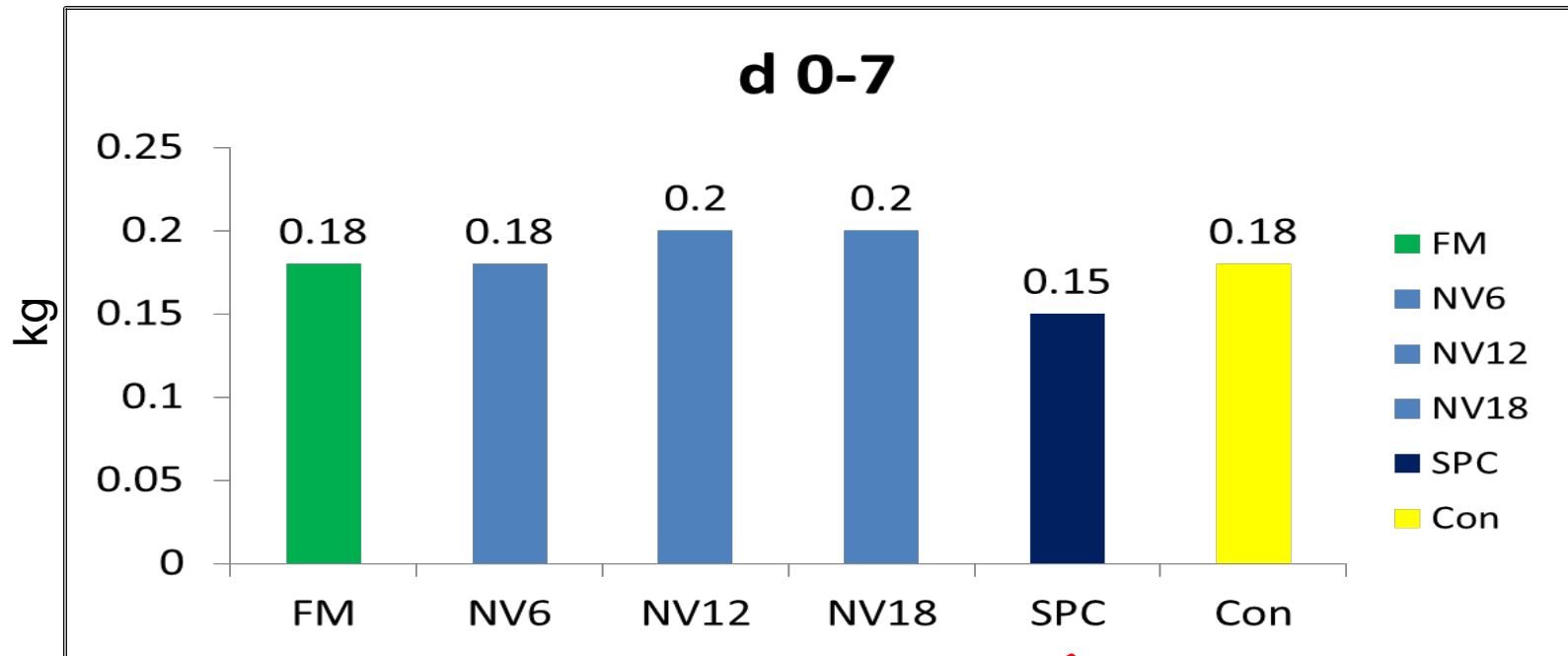


## 6 Dietary Treatments

- 1) Fishmeal: Diet containing 6 or 5% fishmeal
- 2) NutriVance1: Diet containing 6 or 5% NutriVance
- 3) NutriVance 2: Diet containing 12 or 10% NutriVance
- 4) NutriVance 3: Diet containing 18 or 15% NutriVance
- 5) Soy Protein Concentrate: Diet containing 18 or 15% SPC
- 6) SBM (Control): Diet containing none of test ingredients



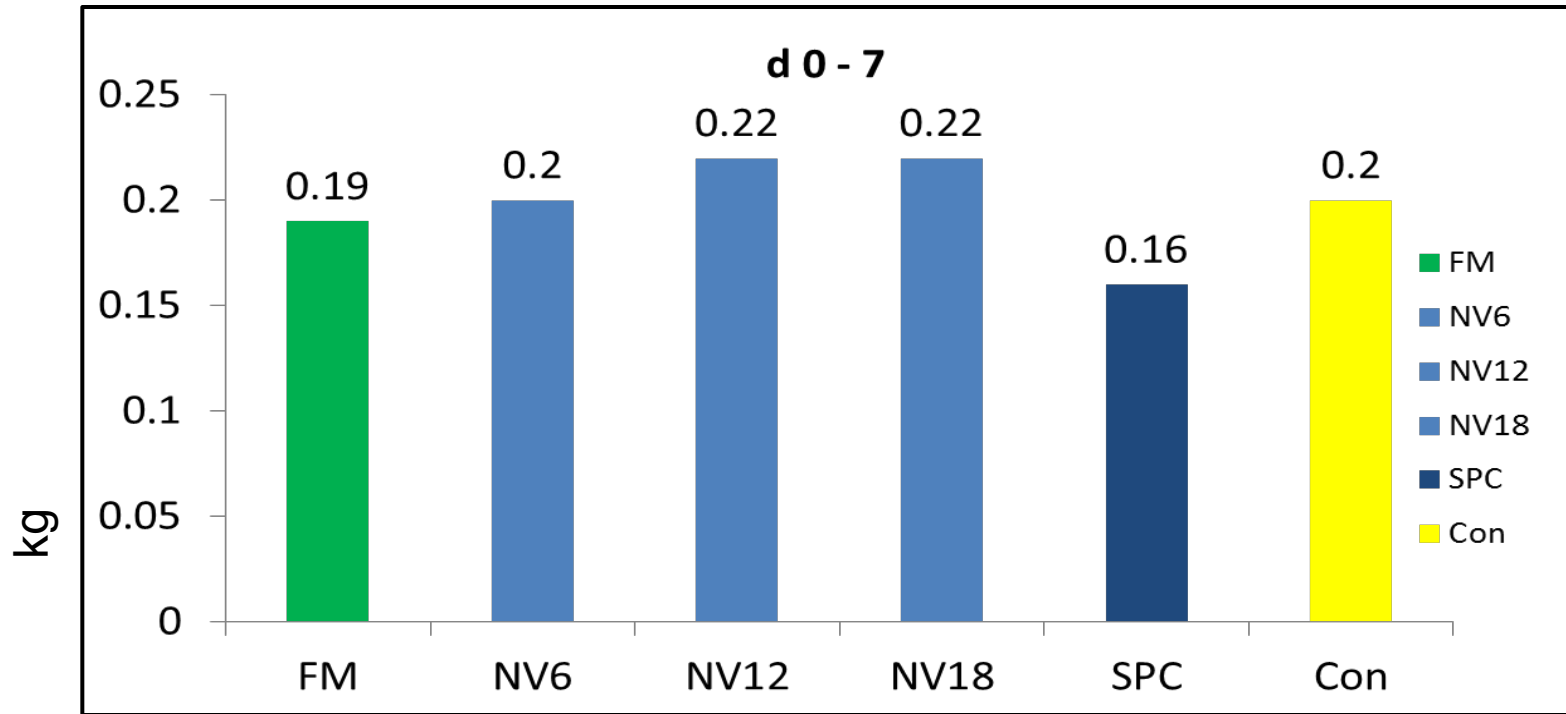
# ADG (D0-7)



- SPC has no oligosaccharides and is lower in soy antigen (glycinin and  $\beta$ -conglycinin)

- Diets containing higher than 12% NutriVance has improved ADG by 30% as compared to SPC

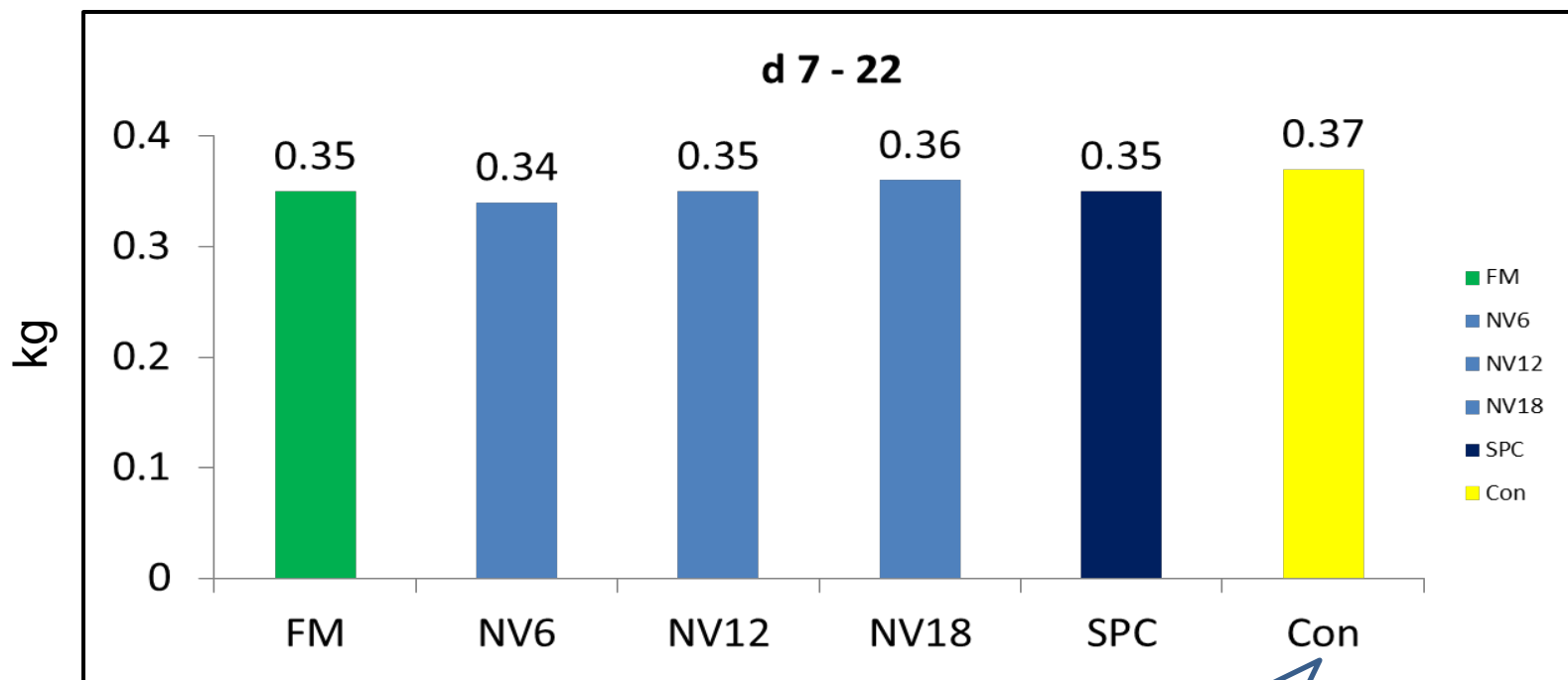
# ADFI (0-7d)



Nutrivance improved ADFI 37.5% as compared to SPC

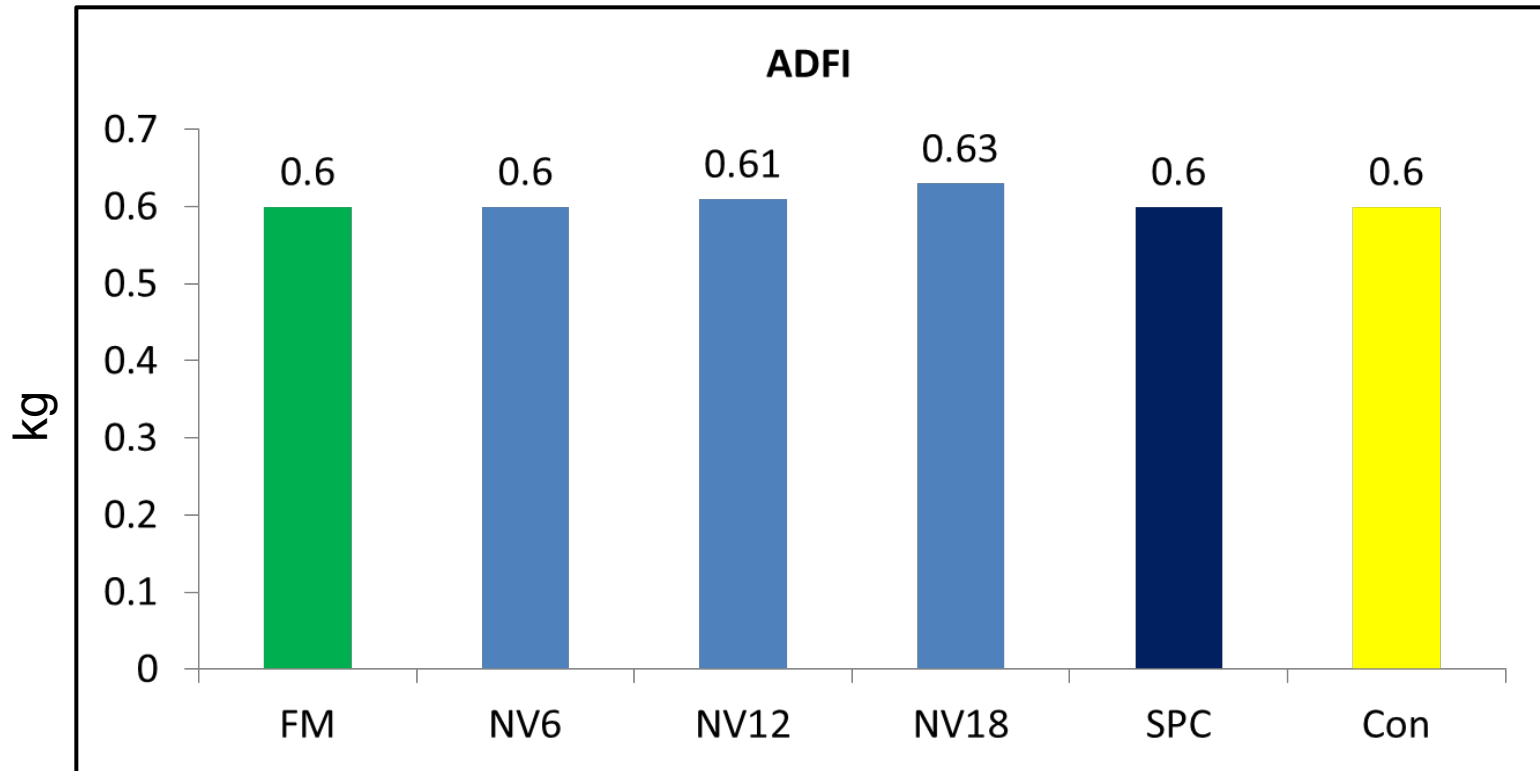


## ADG (D7-22 )



Control with only SBM had the highest ADG during the 2<sup>nd</sup> phase

## ADFI (d7-22)



No difference between treatments

## Overall Performance (D0-35)

|             | FM    | NV6   | NV12  | NV18  | SPC   | Con   |
|-------------|-------|-------|-------|-------|-------|-------|
| ADG,kg      | 0.41  | 0.39  | 0.40  | 0.42  | 0.40  | 0.41  |
| ADFI,kg     | 0.65  | 0.66  | 0.65  | 0.68  | 0.66  | 0.66  |
| F:G         | 1.59  | 1.67  | 1.61  | 1.59  | 1.64  | 1.59  |
| Final Wt,kg | 19.90 | 19.45 | 19.70 | 20.50 | 19.61 | 20.14 |

# Summary

- NutriVance has significantly improved ADG and ADFI during d0-7 after weaning as compared to SPC
- The inclusion rate of NutriVance in the nursery pigs diets can be up to 18%



# CONCLUSIONS

- 1) **NutriVance proved to be the best protein source for young piglets as shown in two trials run by University Researchers**
- 2) **NutriVance can replace high quality fish meal or other soy proteins such as HP300, SPC and Pepsoygen for nursery pig diets with the same or higher growth performance**
- 3) **The inclusion rate of NutriVance in the nursery pig diets can be up to 18%**

Thank you for your attention !

**NutriVance** means

**“Nutrition with Advance Knowledge”**

