

Are Growth Performance and Fecal Score in Weaning Pigs Affected by the Inclusion Level of Potato Protein Concentrate and the Enclosed Glycoalkaloids in Iso-Nitrogenous Diets?

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Thank you to my co-authors:
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How we use the potato

18-20%
Starch

1-2%
Fibres



1-2%
Protein

73-78%
Potato-juice

Background

- ◇ Potatoes self defense system
- ◇ α -solanine & α -chaconine so-called glycoalkaloids = GA
- ◇ Toxic in certain levels
- ◇ Pure form: Bitter-off taste - dry mouthfeel
- ◇ Content vary much between potato varieties - multifactorial
- ◇ GA can be removed or reduced by processing – increased energy
- ◇ Varying amount in standard potato protein concentrate (PPC)
- ◇ Focus on:
 - ◇ the content of GA
 - ◇ the inclusion level in the diet

Or max. 5 % PPC

**DK: Guiding max. level is 200 ppm
solanine in complete feed for piglets**



Objective and Hypothesis

Objective

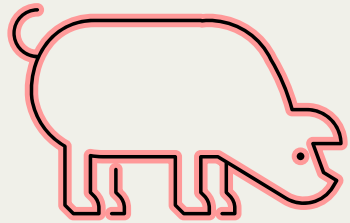
- ◇ Effect of increasing amount of standard PPC fed to weaner pigs
 - ◇ Keeping the diets iso-nitrogenous
 - ◇ Substituting mainly SPC
 - ◇ Determine maximum tolerated level of α -solanine and α -chaconine – total glycoalkaloids
 - ◇ Measured on growth, feed intake, feed conversion ratio and fecal score

Hypothesis

- ◇ “Increasing levels of standard PPC in iso-nitrogenous pig diets from 0-45 days after weaning will affect performance negatively because of GA content when substituting other protein ingredients”

Design

Terms: 0-13 days = pre-starter
13-24 days = starter
24-45 days = grower



- ◇ 720 pigs ~ 7 kg of bodyweight ~ 28 days old (newly weaned)
- ◇ Gender mixed “50/50” pen wise, 9 piglets per pen
- ◇ Feed & water supplied *ad libitum* for 45 days trial period
- ◇ 3 phases: 0-13 days, 13-24 days, 24-45 days

These are the inclusion rates of **PotaPro 1500** in the experimental diets

Group	CTRL	PPC-S	PPC-H	PPC-EH
<ul style="list-style-type: none">• 0-13 days• 13-24 days• 24-45 days	<ul style="list-style-type: none">• No PotaPro 1500• No PotaPro 1500• No PotaPro 1500	<ul style="list-style-type: none">• 4 %• 2 %• 0 %	<ul style="list-style-type: none">• 8 %• 3.5 %• 2 %	<ul style="list-style-type: none">• 12 %• 5 %• 3.5 %
	”Control”	”standard”	”High”	”Extremely High”

Results 0-13 days (pre-starter)

Group	CTRL	PPC-S	PPC-H	PPC-EH
Pens (n)	20	20	20	20
Piglets	180	180	180	180
0-13 days				
PotaPro 1500, %	0	4	8	12
<i>α-solanine, ppm</i>	0.42*	47.2	94.4	141.6
<i>α-chaconine, ppm</i>	0.77*	68.28	136.56	204.84
Initial BW, kg	7.04	7.04	7.04	7.04
BW, day 13, kg	10.43	10.57	10.66	10.36
ADG, g/d	211	221	226	207
ADFI, kg/d	0.19	0.21	0.21	0.19
FCR, kg/kg	0.92	0.97	0.93	0.93

Terms

BW Body Weight, kg

ADG Average Daily Gain, g/day

ADFI Average Daily Feed Intake, kg/day

FCR Feed Conversion Ratio, kg/kg (feed:gain)



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a,b Means in the same row with different superscripts differ significantly ($p < 0.05$)

* From 1 % PotaPro 200 to fulfill amino acid profile of CTRL diet

Results 13-24 days (starter)

Group	CTRL	PPC-S	PPC-H	PPC-EH
Pens (n)	20	20	20	20
Piglets	180	180	180	180
13-24 days				
PotaPro 1500, %	0	2	3.5	5
<i>α-solanine, ppm</i>	-	23.6	41.3	59
<i>α-chaconine, ppm</i>	-	34.14	59.75	85.35
BW, day 13, kg	10.43	10.57	10.66	10.36
BW, day 24, kg	14.84^a	15.91^b	15.47^{ab}	15.09^a
ADG, g/d	428^a	528^b	485^{ab}	447^a
ADFI, kg/d	0.62^a	0.67^b	0.67^b	0.61^a
FCR, kg/kg	1.52	1.32	1.42	1.37

Terms

BW *Body Weight, kg*

ADG *Average Daily Gain, g/day*

ADFI *Average Daily Feed Intake, kg/day*

FCR *Feed Conversion Ratio, kg/kg (feed:gain)*

Results 24-45 days (grower)

Group	CTRL	PPC-S	PPC-H	PPC-EH
Pens (n)	20	20	20	20
Piglets	180	180	180	180
24-45 days				
PotaPro 1500, %	0	0	2	3.5
<i>α-solanine, ppm</i>	-	-	23.6	41.3
<i>α-chaconine, ppm</i>	-	-	34.14	59.75
BW, day 24, kg	14.84^a	15.91^b	15.47^{ab}	15.09^a
BW, day 45, kg	29.64	29.28	30.11	29.89
ADG, g/d	702	690	733	727
ADFI, kg/d	1.07	1.05	1.08	1.08
FCR, kg/kg	1.52	1.52	1.48	1.50

Terms

BW Body Weight, kg

ADG Average Daily Gain, g/day

ADFI Average Daily Feed Intake, kg/day

FCR Feed Conversion Ratio, kg/kg (feed:gain)

Results 0-45 days

Terms

BW

Body Weight, kg

ADG

Average Daily Gain, g/day

ADFI

Average Daily Feed Intake, kg/day

FCR

Feed Conversion Ratio, kg/kg (feed:gain)

Group	CTRL	PPC-S	PPC-H	PPC-EH
PotaPro 1500, 0-13 days	0	4	8	12
PotaPro 1500, 13-24 days	0	2	3.5	5
PotaPro 1500, 24-45 days	0	0	2	3.5
0-45 days				
Initial BW, kg	7.04	7.04	7.04	7.04
BW, day 45, kg	29.64	29.28	30.11	29.89
ADG, g/d	463^a	492^{ab}	508^b	480^{ab}
ADFI, kg/d	0.65^a	0.68^{ab}	0.70^b	0.66^{ab}
FCR, kg/kg	1.40	1.39	1.38	1.37

NB: The trial was run in 2021

DK average performance piglets	2021
ADG, g/d (7-30 kg)	464
DK top 25 % performance piglets	2021
ADG, g/d (7-30 kg)	511



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^{a,b} Means in the same row with different superscripts differ significantly (p < 0.05)

SEGES INNOVATION Nr. 2204, 2022

Results Health in the first 0-13 days

Fecal scoring

0: "Normal feces"

1: "Soft feces"

2: "Mild diarrhea"

3: "Severe diarrhea"

No negative effect of GA on diarrhea

Difference 0.20

Group	Diarrhea probability	P-value
CTRL	0.67	0.110
PPC-S	0.57	0.112
PPC-H	0.60	0.267
PPC-EH	0.47	0.003

Full model

Group		Group	Diff. in diarrhea probability	P-value
CTRL	Vs.	PPC-S	0.11	0.385
		PPC-H	0.07	0.683
		PPC-EH	0.20	0.015
PPC-S	Vs.	PPC-H	-0.03	0.955
		PPC-EH	0.10	0.505
PPC-H	Vs.	PPC-EH	0.13	0.220

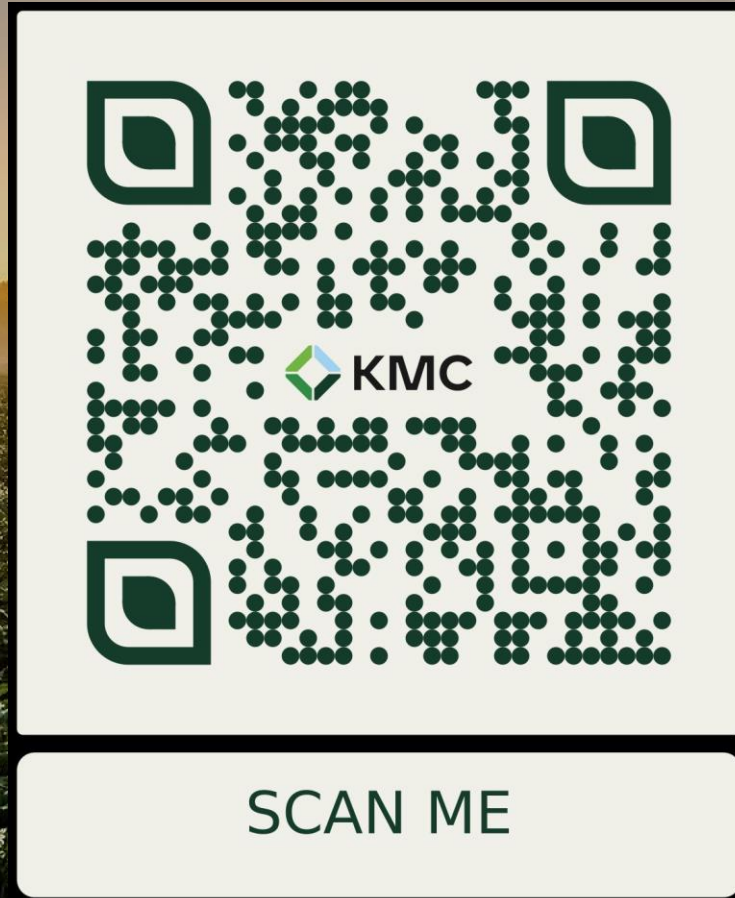
Pairwise comparison

Conclusion...

- ◇ Standard PPC (**PotaPro 1500**) did not affect performance of weaned pigs negatively
 - ◇ FCR did not differ significantly between dietary treatments
 - ◇ ADFI increased significantly for PPC-H fed pigs in 13-24 days and in 0-45 days
 - ◇ ADG Increased significantly for 0-45 days in “PPC-H” fed pigs
- ◇ Overall, standard PPC (**PotaPro 1500**) is a qualified substitute for SPC in weaner piglet diets
 - ◇ Even at extremely high (12 %) inclusion levels in pre-starter diets for weaner piglets
- ◇ The studied levels of glycoalkaloids did not seem to harm the piglets



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