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Influence of Copper sulphate and tribasic Copper chloride on growth performance of weaning piglets



Your Key to a world of ingredients...

Overview of the general impact of the copper dosage on average daily gain in piglets

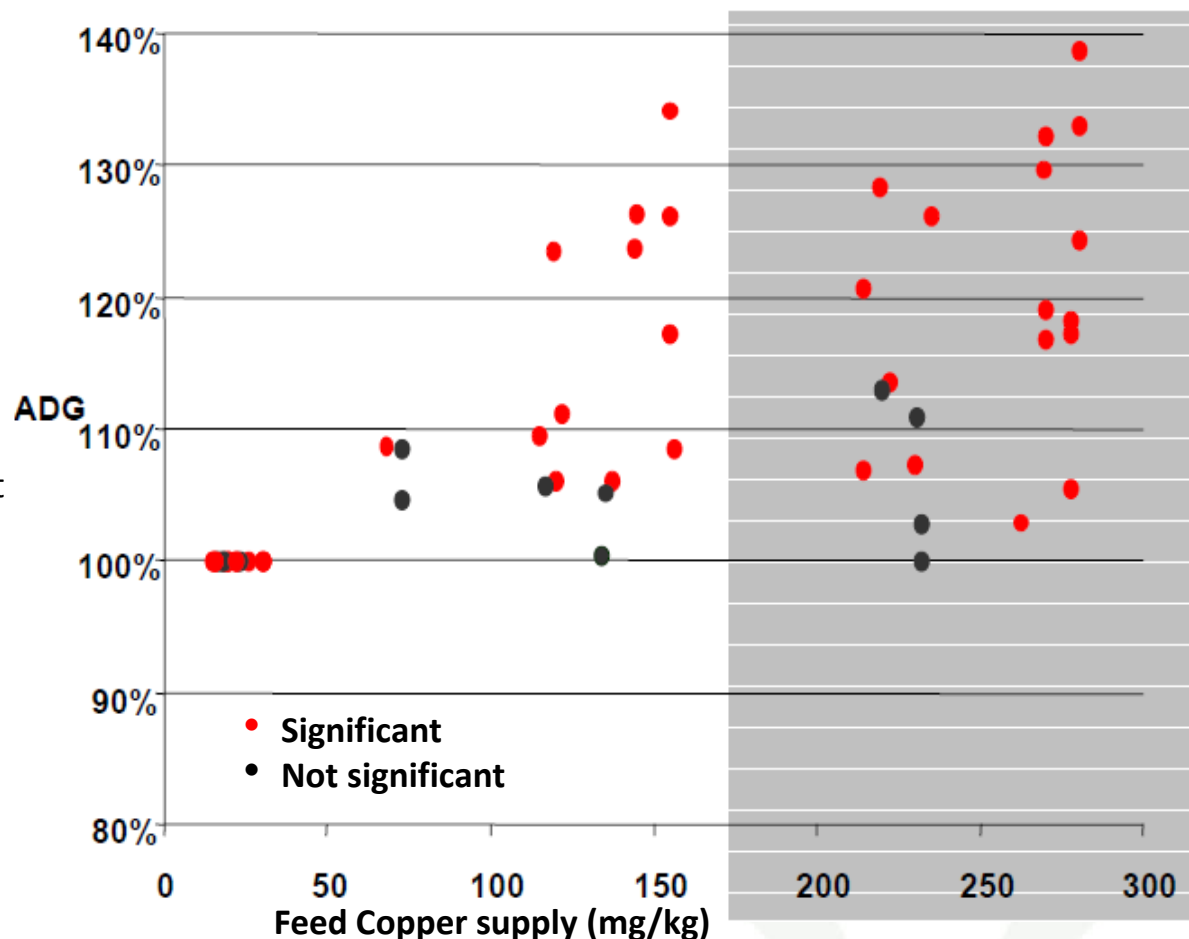
Regression equations for the post weaning period up to 25 kg BW (% means percentage units)

ADG (% of improvement):

$$y = 0.12x + 0.9737$$

($P < 0.01$) from 15 to 162 mg/kg

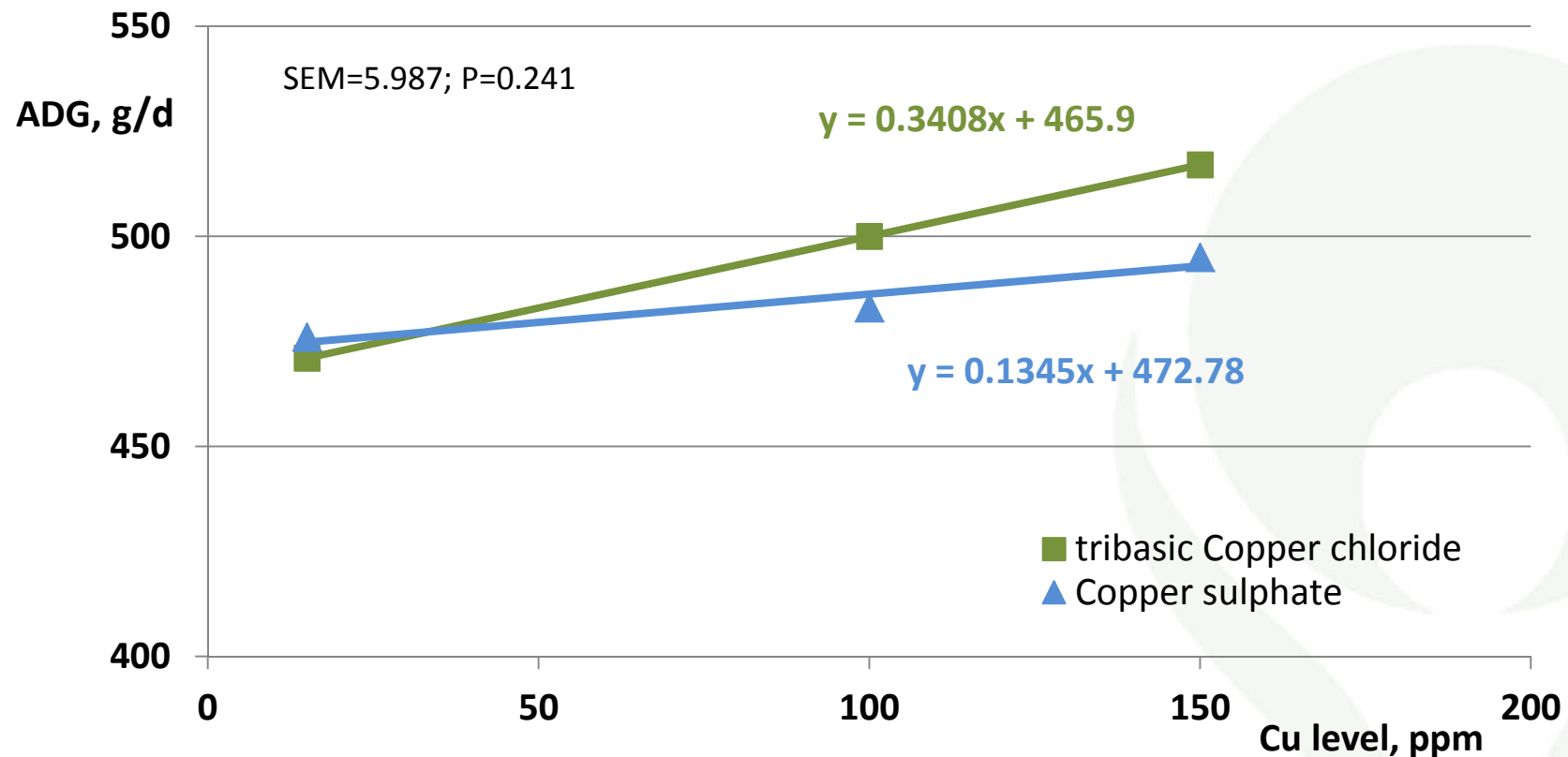
Results of 22 experiments (one experiment compared 4 levels of supply, 12 exp. 3 levels of supply and 9 exp. only two levels of copper sulphate supplementation)



Jondreville *et al.* (2002) *INRA Prod. Anim.* 15, 247-265

Opinion of the Scientific Committee for Animal Nutrition on the use of copper in feedingstuffs (2003)

Dose response effect of various copper sources on Daily gain of weaning piglets (8 week trial)



Winkler et al. (2013) Proc. Schweine- und Geflügelernährung, Wittenberg, GE

Objective of the trial

Is the stronger growth promoting effect of a more efficient copper source (supplementation level 150 ppm Cu) such as tribasic copper chloride repeatable in contrast to copper sulfate in weaning piglets under European production conditions?

Trial setup

- Study conducted at Invivo NSA Research Facility CRZA, Montfaucon (France), Sep-Oct 2013
- 128 piglets weaned at 28 days of age were used (average 8.5 kg)
- Piglets were blocked on the basis of initial weight, sex and maternal origin (Alfa+, LWxLR, GENE+ x GENE+) and then allotted to 32 pens (of 4 animals each)
 - 16 replications (pens) per treatment
- 2 feeding phases:
 - 1: day 1-14
 - 2: day 15-42
- Treatments:
 - (1) Basal Diet + 155 ppm Cu from tribasic Copper Chloride (TBCC)
 - (2) Basal Diet + 155 ppm Cu from Copper Sulphate (CS)
- Diet composition (all experimental diets antibiotic-free!)
 - Phase 1: Wheat, Barley, Soybean meal, extruded soybeans, heat treated wheat, bakery by-product, Whey powder, Soybean oil, Monocalcium phosphate, Potato protein concentrate, Soy protein concentrate, Sugar, Premix
 - Phase 2: Wheat, Corn, Barley, Soybean meal, Rapeseed meal, Premix, Soybean oil

Trial setup (2)

➤ Ingredients:

		Copper Sulphate		Tribasic Copper Chloride	
		Calculated	Analysed	Calculated	Analysed
Phase 1 diet	Crude protein, %	19.2	20.1	19.2	20.5
	Lysine, %	1.34	1.37	1.34	1.44
	Copper, ppm	162	159	162	154
Phase 2 diet	Crude protein, %	17.5	17.9	17.5	17.9
	Lysine, %	1.18	1.16	1.18	1.13
	Copper, ppm	161	137	161	154

Trial setup (3)

- Piglets individually weighted at weaning (day 1), at day 4, day 7, day 14, day 28 and at the end of the post weaning phase (day 42)
- Feed intake measured weekly per pen (incl. refusals)
- Fecal score assessed 5 days per week:
 - 1 = solid
 - 2 = soft
 - 3 = liquid
- Data analyzed using GLM procedure of SAS Version 8.02 with treatment, block and group as effects.

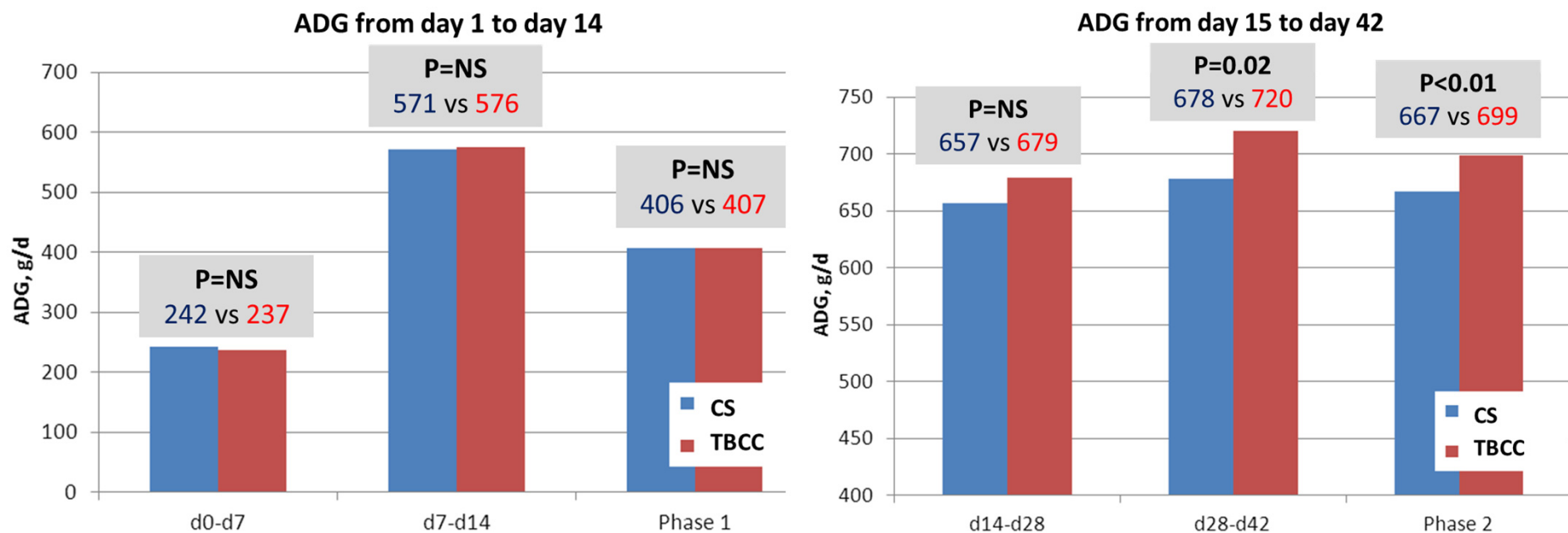
Results

- Sanitary context:
 - All piglets remained healthy throughout the experiment as indicated by:
 - low mortality (no piglet died during the trial)
 - no degraded faecal score (diarrhoea)
 - high level of performance
 - Only one piglet was removed from trial because of lameness and thus poor performance (group TBCC)
 - In order to have similar initial weight, the entire block (2 pens) was removed!
 - Thus with 15 pens/TRT instead of 16 were used for statistical evaluation.

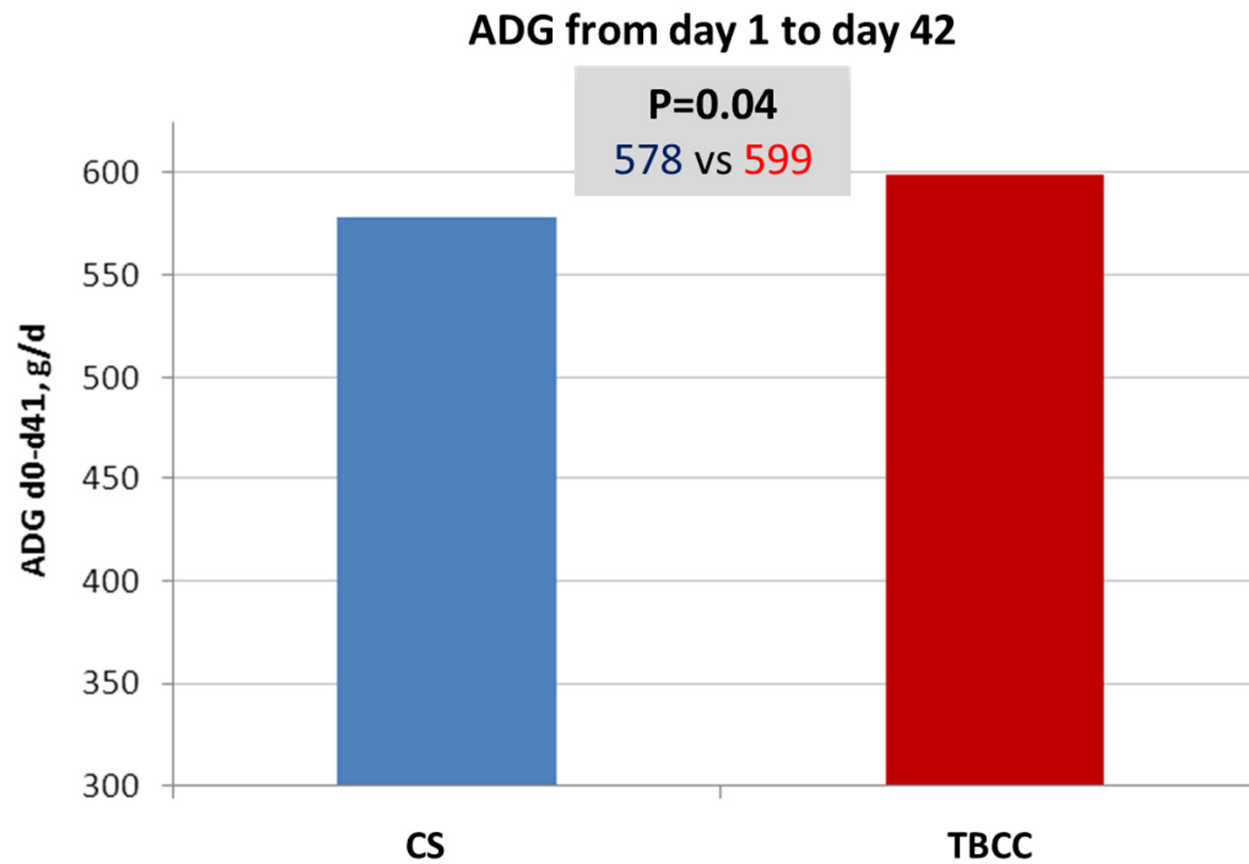
Results – Bodyweight and Feed Intake

	Copper Sulphate	Tribasic Copper Chloride	P-Level
	mean ±sd	mean ±sd	
BW1	8.5 1.5	8,5 1.5	
BW7	10.2 1.6	10,1 1.6	
BW14	14.2 2.3	14,2 2.1	
BW28	23.4 3.3	23,7 2.9	
BW42	32.2 4.1	33.0 3.7	p=0.04
ADFI1-7	270 40	263 48	
ADFI8-14	593 119	595 77	
ADFI15-21	858 133	861 91	
ADFI22-28	1071 125	1102 123	
ADFI29-35	1234 160	1289 211	p=0.05
ADFI36-42	1155 166	1303 174	p=0.02
ADFI1-14	432 65	429 57	
ADFI15-42	1077 114	1133 124	p=0.06
ADFI1-42	856 92	892 96	p=0.08

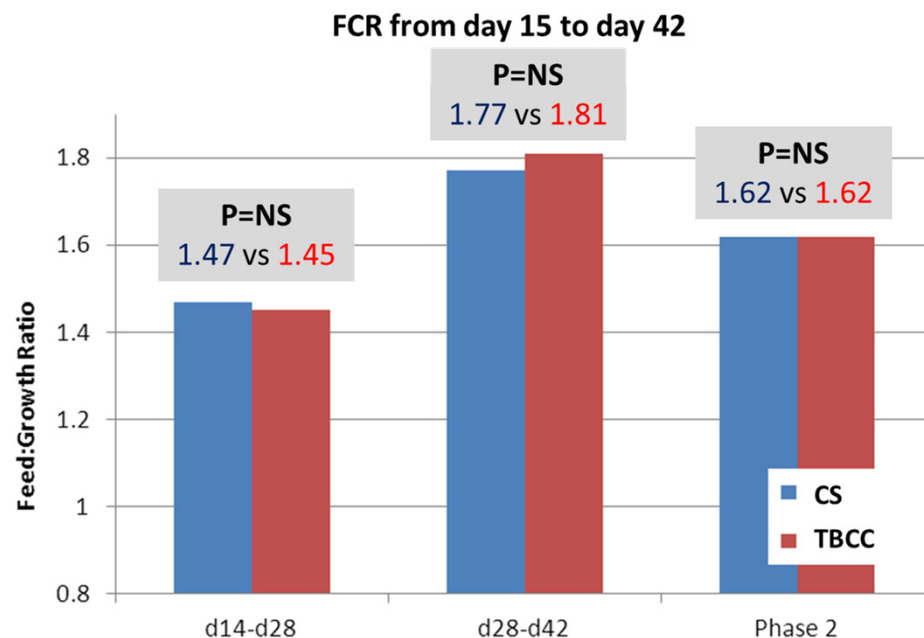
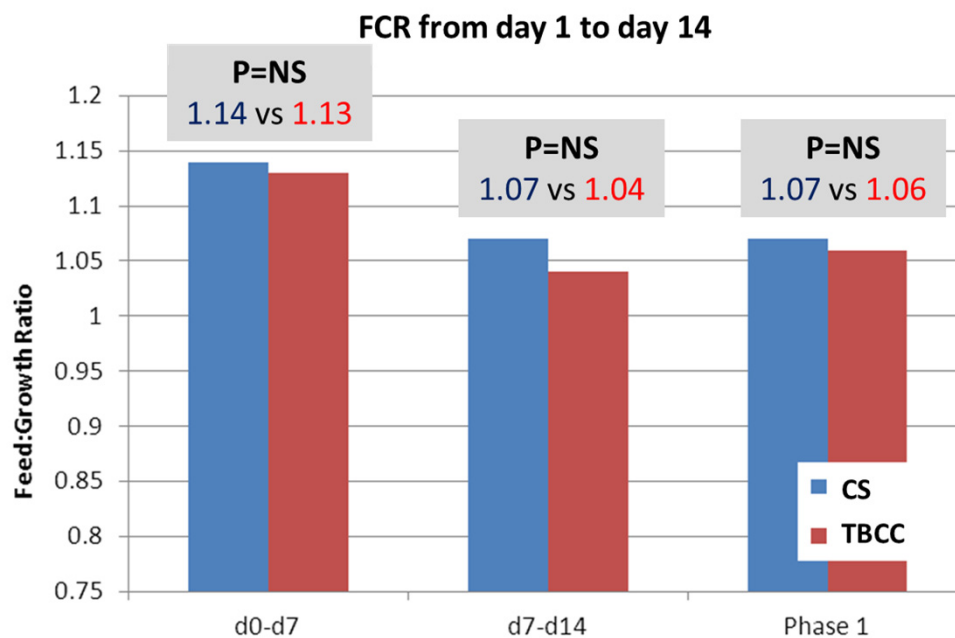
Results – Daily Gain



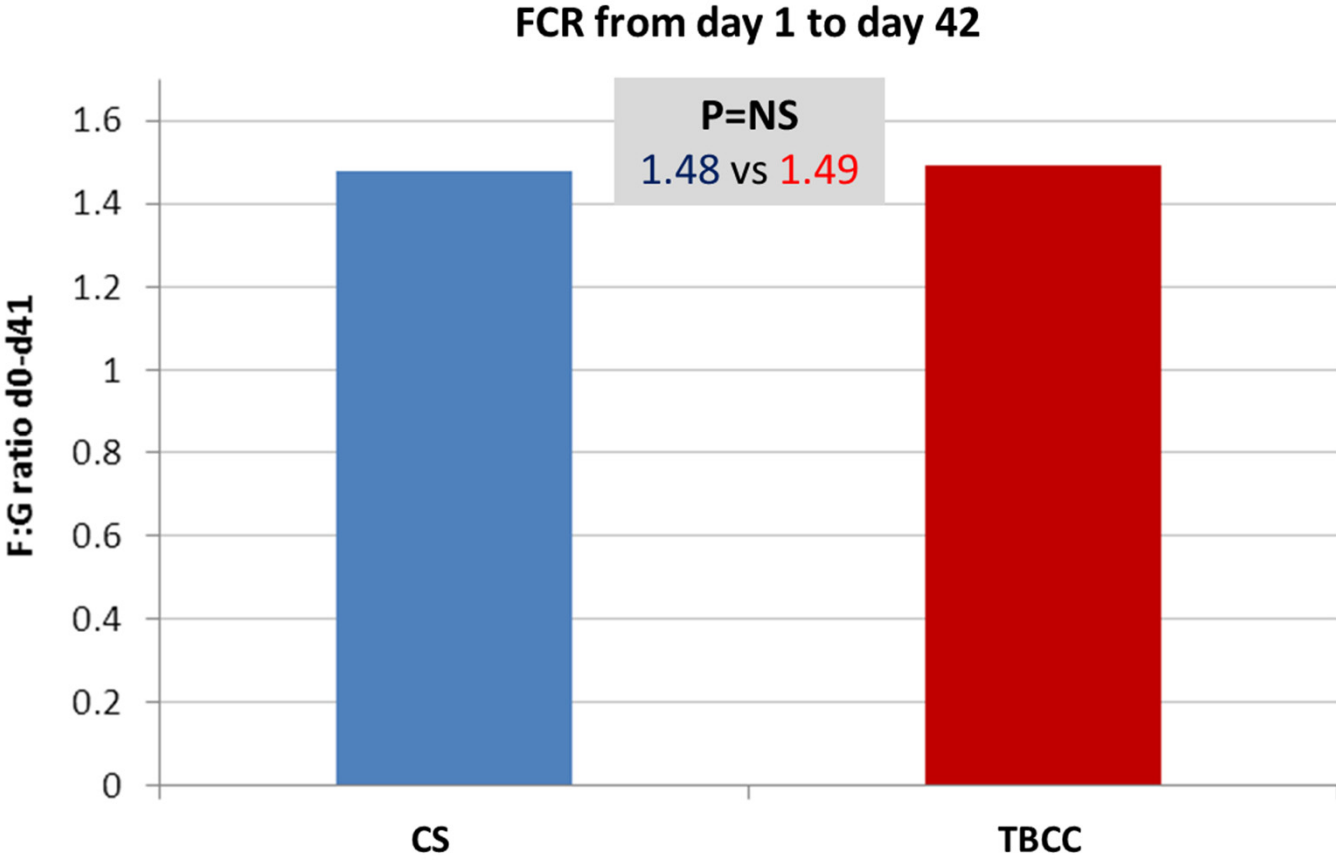
Results – Daily Gain (2)



Results - Feed Conversion Ratio



Results - Feed Conversion Ratio (2)



Summary / Conclusion

- A trial was conducted to proof the growth promoting effect of tribasic copper chloride in contrast to copper sulphate at 150 ppm supplementation level in weaning piglet diets under European productions conditions.
- Trial was conducted under good sanitary condition (no diarrhoea, no mortality)
- In this trial, using tribasic Copper Chloride instead of Copper Sulphate resulted in:
 - significantly improved body weight at trial end (33.0 vs. 32.2 kg; $P=0.04$)
 - significantly improved feed intake in the last 2 trial weeks
 - significantly improved growth performance (599 vs. 578 g/d; $p=0.04$)
 - no differences in feed conversion
- **Thus a higher efficiency of tribasic Copper Chloride in contrast to Copper Sulphate was demonstrated which confirms growth data of previous piglet trials.**