# Effect of Trace Mineral Source in Sow and Nursery Diets on Nursery Pig Growth Performance

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## Objective

The objective of this study was to determine the effects of trace mineral sources in sow diets (inorganic vs. complexed Zn, Mn, and Cu) and nursery diets (inorganic vs. complexed Zn and Cu) on growth performance in the nursery phase. We hypothesized that adding trace minerals as metal amino acid complexes to gestating and lactating sow diets (Zn, Mn, and Cu), and to nursery pig diets (Zn and Cu), will improve the growth performance of nursery pigs.

## Materials and Methods

**Animals**

- 216 weanling piglets were used in this study
  - ACMC X Pietrain
  - 28 d of age

**Treatments**

- 2 X 2 factorial design
- Each combination of dietary treatments (TM source in sow and nursery diets) had 9 replicate pens with 6 piglets per pen (3 intact males and 3 females)

**Statistical Analysis**

- Growth performance variables analyzed by GLM model of SAS, with fixed effects of:
  - Sow diet, nursery diet, and sow diet X nursery diet interaction
- 95% CI reported for fixed effects
- Experimental unit: pen
- Percentage mortality analyzed as binary variable, using chi-square test (PROC FREQ) of SAS

### Table 1. Treatment Diets by Experimental Phase

| | Treatment | | | |
|---|---|---|---|---|
| | Sow Diets | | Nursery Diets | |
| Mineral, ppm | ICZ-S | CCZ-S | ICZ-N | CCZ-N |
| Zn as ZnO | 110 | 60 | - | - |
| Mn as MnO | 40 | 20 | - | - |
| Cu as $CuSO_4$ | 15 | 5 | 160 | - |
| Zn as $ZnSO_4$ | - | - | 110 | - |
| Zn as Availa®Zn[a] | - | 50 | - | 110 |
| Mn as Availa®Mn[b] | - | 20 | - | - |
| Cu as Availa®Cu[c] | - | 10 | - | 160 |

[a] Availa-Zn zinc amino acid complex
[b] Availa-Mn manganese amino acid complex
[c] Availa-Cu copper amino acid complex

### Table 2. Diet Compositions

| Ingredient, % | Pre-starter (d 1 to 17) | Starter (d 18 to 37) |
|---|---|---|
| Corn | 21.25 | 45.00 |
| Whey powder | 15.00 | 5.00 |
| Extruded soybeans | 8.50 | 3.00 |
| Barley | 40.00 | 21.10 |
| Soybean meal | 10.00 | 20.54 |
| Soy oil | 2.31 | 1.74 |
| Monocalcium phosphate | 0.25 | 0.60 |
| Calcium formate | 0.70 | 0.70 |
| Calcium carbonate | 0.40 | 0.52 |
| Sodium chloride | 0.20 | 0.31 |
| L-Lysine HCl | 0.40 | 0.38 |
| Vitamin/Trace mineral premix[a] | 0.50 | 0.50 |
| DL-Methionine | 0.15 | 0.13 |
| L-Threonine | 0.04 | 0.07 |
| L-Valine | 0.09 | 0.06 |
| L-Tryptophan | 0.03 | 0.03 |
| Fumaric acid | 0.15 | 0.15 |
| Citric acid | 0.15 | 0.15 |
| Phytase[b] | 0.02 | 0.02 |
| NSP-enzyme[c] | 0.01 | 0.01 |

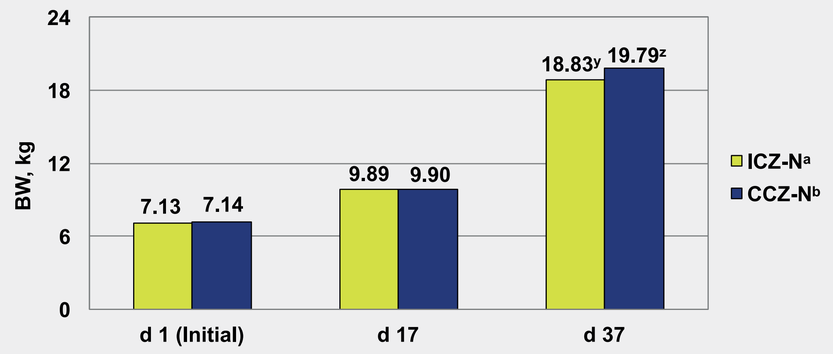
[a] Vitamin/Trace mineral premix included dietary treatment; The premix was consistent between Pre-starter and Starter diets, with the exception of treatment differences
[b] RONOZYME® NP, DSM, Netherlands; To provide 1500 FYT/kg diet
[c] ROVABIO® EXCEL, Adisseo, France; To provide 152 U/kg diet beta-glucanase

## Results

No statistical differences were observed for mortality ($P > 0.5$) or interaction of sow diet X nursery diet ($P > 0.3$).

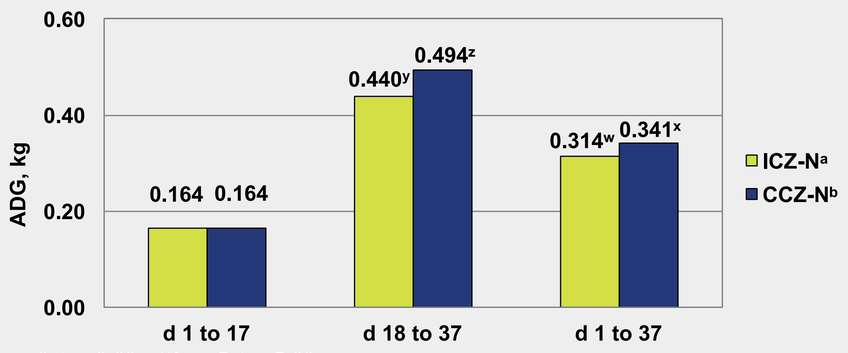
Trace mineral source in sow diets had no effect on growth performance of nursery pigs ($P > 0.12$), except for feed to gain d 18 to 37, which tended to be increased ($P = 0.06$) in pigs from sows that were fed complexed trace minerals (1.56 vs. 1.51).

### Figure 1. Body Weight of Pigs Fed Inorganic and Complexed Minerals in Nursery Diets



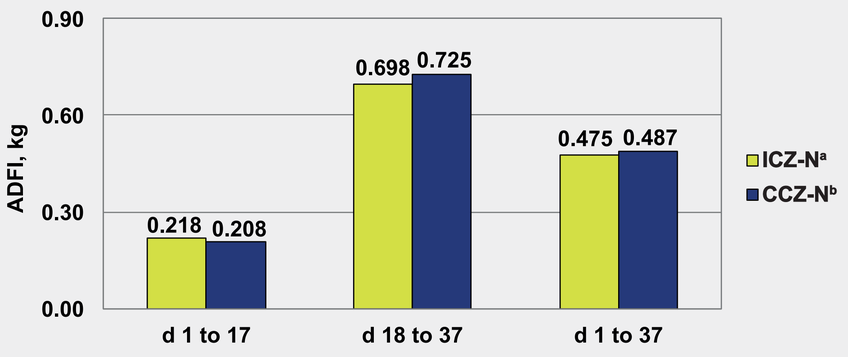

[a] ICZ-N: 160 ppm Cu from $CuSO_4$ + 110 ppm Zn from $ZnSO_4$
[b] CCZ-N: 160 ppm Cu from Availa®Cu copper amino acid complex + 110 ppm Zn from Availa®Zn zinc amino acid complex
[yz] Means lacking a common superscript letter differ, $P \leq 0.02$

### Figure 2. Average Daily Gain of Pigs Fed Inorganic and Complexed Minerals in Nursery Diets



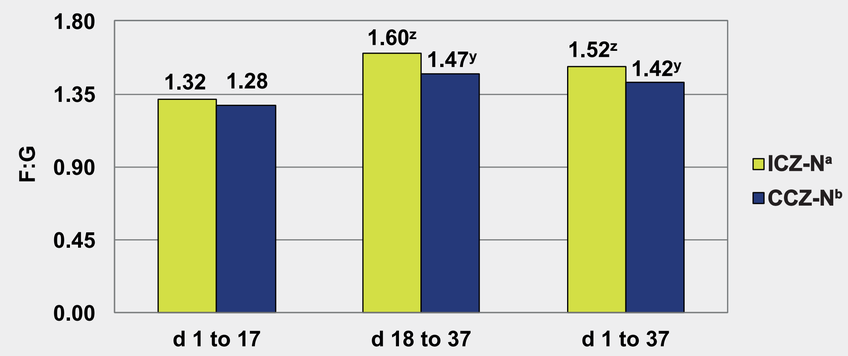

[a] ICZ-N: 160 ppm Cu from $CuSO_4$ + 110 ppm Zn from $ZnSO_4$
[b] CCZ-N: 160 ppm Cu from Availa®Cu copper amino acid complex + 110 ppm Zn from Availa®Zn zinc amino acid complex
[wx] Means lacking a common superscript letter differ, $P \leq 0.02$
[yz] Means lacking a common superscript letter differ, $P \leq 0.01$

### Figure 3. Average Daily Feed Intake of Pigs Fed Inorganic and Complexed Minerals in Nursery Diets




[a] ICZ-N: 160 ppm Cu from $CuSO_4$ + 110 ppm Zn from $ZnSO_4$
[b] CCZ-N: 160 ppm Cu from Availa®Cu copper amino acid complex + 110 ppm Zn from Availa®Zn zinc amino acid complex

### Figure 4. Feed:Gain of Pigs Fed Inorganic and Complexed Minerals in Nursery Diets




[a] ICZ-N: 160 ppm Cu from $CuSO_4$ + 110 ppm Zn from $ZnSO_4$
[b] CCZ-N: 160 ppm Cu from Availa®Cu copper amino acid complex + 110 ppm Zn from Availa®Zn zinc amino acid complex
[yz] Within time period, means lacking a common superscript letter differ, $P \leq 0.01$

## Conclusions

Providing Zn and Cu as metal amino acid complexes in nursery diets is a means to increase growth rate and improve feed/gain in nursery pigs.