



balchem®

KeyShure®

Precision Release Minerals

Balchem Research Summary

**KeyShure — Delivers animal performance
in the presence of Antagonists**

A summary of a Balchem sponsored study conducted by M. D. Sims^{*1} and M. J. de Veth², ¹Virginia Diversified Research Corp., Harrisonburg, VA, ²Balchem Corp., New Hampton, NY.

Summary written by B. A. Barton, Ph.D., Research and Product Development Manager, Balchem Corporation, New Hampton, NY.

Background

IP6 (inositol hexaphosphate), also known as phytate, is a naturally occurring polyphosphorylated carbohydrate found in many feedstuffs including cereal grains, corn, and wheat bran. At least 97% of the inositol phosphates contained in grains occurs as IP6. Phytate is a known trace mineral antagonist. It binds with a trace mineral, such as Zinc (Zn), and reduces its availability to the animal. The reduced mineral bioavailability can negatively impact animal performance (e.g. weight gain, feed to gain ratio, mortality). In commercial monogastric diets, the enzyme phytase is often added to the diet to break down phytate and minimize its impact on animal performance. Even in this situation, phytase addition does not break down all the phytate. Organic trace minerals are fed to overcome the effect of antagonist(s) in the diet and restore animal performance.

Balchem has helped develop a broiler chick experimental model in which a diet containing known amounts of an antagonist is supplemented with Zn from either Zinc sulfate ($ZnSO_4$) or KeyShure[®] Zinc and broiler performance is monitored. The model is based on the principle that if supplemental zinc is able to mitigate negative effects on broiler growth and feed to gain ratio in the presence of phytate, then it is effectively able to resist binding by the antagonist and thus have higher bioavailability.

Previously, KeyShure Zinc, when fed as part of a broiler diet using cottonseed hulls (CSH) as an antagonist, restored broiler chick weight gain and feed to gain ratio to levels comparable to that achieved in the positive control treatment (Sims and de Veth, 2008). CSH contain two antagonists: phytate and gossypol. The decision to use phytate in the most recent work, instead of CSH, was based on the fact that phytate addition allows a more precise addition of a known amount of antagonist to the diet. The information reported below is from a broiler chick experiment where phytate was used as the antagonist.

General Experimental Design

Broiler chicks (Hubbard x Cobb) were fed diets containing no phytate or phytate (0.15% IP6) with or without supplemental Zn (to provide an additional 40 ppm) from either $ZnSO_4$ or KeyShure Zinc. The single phase Corn/Soy based diets were balanced to provide: 20% CP, 1400 kcal/lb Poultry ME, and 5.0 % fat. Basal diet Zn levels were 25 ppm

Treatments:

Treatment ID	Trace Mineral Source	Antagonist
Positive Control	Basal Zn	0
Phytate	Basal Zn	+
Phytate/ $ZnSO_4$	Basal Zn plus $ZnSO_4$ – 40 ppm	+
Phytate/ KeyShure [®] Zinc	Basal Zn plus KeyShure [®] Zinc – 40 ppm	+

The feeding period was 12 days (1 day of age starting on day 0). Hubbard x Cobb broiler chicks were used with 8 replicates of 20 birds/pen for each treatment.

Figure 1. Body weight (d 12) for the positive control (NO IP6) vs. the diets containing the antagonist and either no added Zn (IP6), $ZnSO_4$ (IP6/ $ZnSO_4$) or KeyShure Zinc (IP6/KeyShure Zinc) treatments. Performance of the broilers for the positive control treatment was set to 100 and all others treatments compared to it.

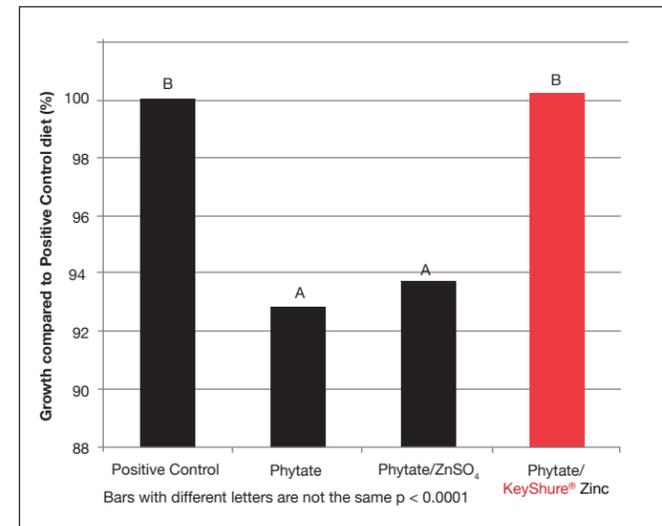
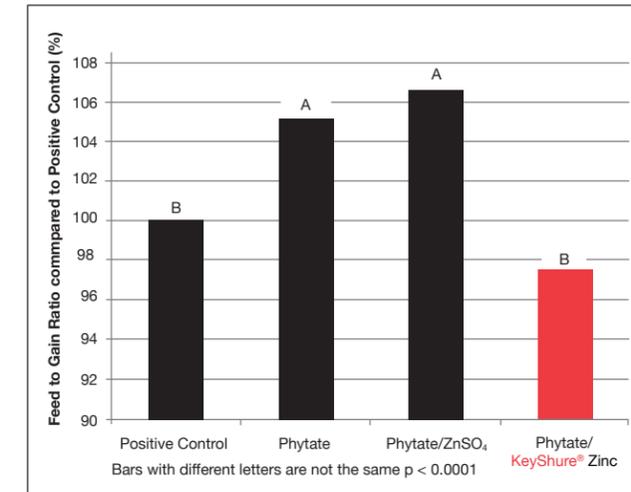


Figure 2 illustrates feed/gain (d 12) for the positive control feed/gain (d 12) for the positive control (NO IP6) vs. the diets containing the antagonist and either no added Zn (IP6), $ZnSO_4$ (IP6/ $ZnSO_4$) or KeyShure Zinc (IP6/KeyShure Zinc) treatments. Performance of the broilers for the positive control treatment was set to 100 and all others treatments compared to it. Lower the value = better the performance.



Results/Discussion

Figure 1. Addition of the antagonist to the diet depressed growth by approximately 7% ($p < .0001$) vs. the Positive Control treatment. When $ZnSO_4$ was added to the diet containing the antagonist, weight gain was not restored and growth was depressed by approximately 6%. Only the addition of KeyShure Zinc, to the diet containing the antagonist, was able to restore weight gain to levels obtained on the positive control treatment. This indicates that KeyShure Zinc was more available than inorganic Zn in the presence of the antagonist phytate and it was able to improve broiler growth.

Figure 2. Addition of the antagonist to the diet improved ($p < .0004$) feed to gain ratio by 5% vs. the positive control treatment. When $ZnSO_4$ was added to the diet containing the antagonist, the feed to gain ratio was still greater. Only the addition of KeyShure Zinc to the diet was able to restore the feed to gain ratio to levels obtained with the positive control diet. This also indicates that KeyShure Zinc was more available in the presence of the antagonist phytate and it was available to support a more efficient level of feed conversion than inorganic Zn.

Conclusion

- Phytate, as expected, proved to be an effective antagonist because it reduced growth rate and feed to gain ratio when added to the basal diet.
- The differences between Zn sources are amplified in the presence of antagonists. KeyShure Zinc, because of its higher bioavailability, permitted the broilers to achieve better growth and feed conversion.
- These results, along with the Sims and De Veth (2008) study confirms that KeyShure Zinc supplementation can overcome the negative impact of antagonists on animal performance.

Balchem Corporation
5 Paragon Drive, Montvale, NJ 07645 USA
845-326-5600
anh.marketing@balchem.com
www.Balchem.com

KeyShure is a trademark of Balchem Corporation.
©2026 Balchem Corporation. All rights reserved.
1911-025