The effects of different Zinc sources on egg production, characteristics and hatchability in broiler breeder hens

E. Haghvirdilou[A,B], *A. Karimi* [C], *Zeinab Khoobbakht* [D]

[A]Department of Animal Science, Ministry of Agriculture, Tabriz, Iran.
[C]Department of Animal Science, Faculty of Ahar Agriculture and Natural Resources, University of Tabriz, Tabriz, Iran.
[D]Department of Animal Science, College of Agriculture, Guilan University, Rasht, Iran
[B]Email: haghverdi2000@gmail.com

Zinc as a trace mineral is essential for normal growth and productivity in poultry nutrition. Because of zinc-phytate compound making dietary zinc less available, supplementary zinc must be added. Currently, there are two main zinc sources commercially used by the poultry feed industry organic and inorganic forms. Organic forms of trace mineral such as zinc-methionine chelate are expensive, so most diets contain the less expensive, inorganic forms such as zinc oxide. Replace with ‘Zinc oxide is cheaper, but is less bioavailable for poultry than organic forms. Zinc sulphate is another commonly used source of inorganic zinc, however it may negatively affect absorption of other nutrients (Batal et al, 2001). Recently, like conventional sources, zinc nanoparticles (nano zinc) have been added to poultry feed and noticeably, nano zinc has improved production performance (Swain et al, 2016). It seems the main reason of higher efficiency of nano zinc particles is related to Related to enzyme, not absorption (Bouwmeester et al, 2009). This experiment was conducted to investigate the effects of different sources of zinc on performance, egg quality of Ross 308 are broiler breeder hens. The experiment was carried out using 112 45-week-old hens in a completely randomized design with 4 treatments, 4 replicates and 7 birds per replicate along with a breeder rooster. The experimental groups included: 1) Basal diet as control group. 2) Basal diet + 50 mg zinc/kg of diet from zinc oxide (ZnO) as mineral source, 3) Basal diet + 50 mg zinc/kg of diet from nano-zinc oxide (n-ZnO). 4) Basal diet + 50 mg zinc/kg diet from zinc methionine (Zn-Met) as organic source. All treatments were iso-methionine. Commercial traits including feed conversion ratio (FCR), egg production, egg weight, shell resistance, shell thickness, haugh unit, fertility and hatchability rates were assessed and calculated. The experiment lasted for 6 weeks. All data were analyzed using Proc GLM of SAS 9.1 and Fertility and hatching rate were analyzed by GENMOD procedure. The results didn’t show significant differences among sources on egg production and egg weight ($P>0.05$). All sources of supplementary zinc improved FCR compared to control group ($P<0.05$). Zinc methionine had significantly higher performance in haugh unit, shell resistance and shell thickness compared to control and zinc oxide treatments ($P<0.05$), Zinc methionine had significantly higher performance in these traits compared to control and zinc oxide treatments, however not compared to n-ZnO ($P>0.05$). There was no substantial differences between experimental groups in fertility rate ($P>0.05$). On the other hand hatchability rate was higher in Zn-Met group than other experimental groups ($P<0.05$). In conclusion it seems supplementation of Zn-Met (zinc methionine) as an organic form can improve the quality and performance of breeder laying hens in comparison with nano (n-ZnO) or mineral (ZnO) forms.

Table1: The effects of different zinc sources on egg parameters in broiler breeder hens.

Experimental group	FCR	Egg production (%)	Egg weight (gr)	Shell resistance (Kg/cm^2)	Shell thickness (mm)	Haugh unit	Fertility rate (%)	Hatchability rate (%)
Con	2.26^a	80.7	60.4	3.36^b	0.38^b	77.58^b	81.82	69.6^b
Zno	2.04^b	81.4	58.2	3.45^b	0.39^b	80.31^b	84.06	$75.6a^b$
n-ZnO	2.03^b	77.5	61.6	3.72^{ab}	0.4^{ab}	81.02^{ab}	83.93	73.8^b
Zn-Met	2.02^b	77.9	60.7	3.9^a	0.42^a	86.93^a	86.51	80.6^a
SEM	0.015	0.94	0.61	0.175	0.06	0.75	1.25	0.96
P-Value	0.005	0.32	0.06	0.007	0.03	0.006	0.7	0.009
a, b: different letter superscript indicate a significant difference ($P<0.05$)								

References

Batal AB, Parr TM and Baker DH (2001*) Poultry Science*. **80**, 87–90.
Bouwmeester H, Dekkers S, Noordam MY (2009) *Regulatory Toxicology and Pharmacology*. **53**(1), 52-62.
Swain PS, Rao SB, Rajendran D, Dominic G and Selvaraju S (2016) *Animal Nutrition*. **2**(3), 134-41.

Special thanks to Orum Gohar Daneh Co. for their financial support.