Research summary

Water quality effects on laying hen performance

About the study

Today's hens produce significantly more eggs compared to hens 50 years ago. While many factors play a role in high-quality egg production, the role water quality plays in this process is relatively unknown. Existing research has left significant gaps in evaluating water's effect on hen production performance. Recommendations on mineral and pH levels in water are based on past research, which does not account for changes in hen genetics over the last decades.

As such, researchers at Dalhousie University sought to study the effect that water quality has on laying hen performance today, taking into account the diversity of water found across Canada.

Methods

To set the stage for their trials, researchers approached producers across the country, requesting 200 ml water samples and providing a questionnaire to capture further water information. Eighty seven water samples were collected from producers in nine provinces: B.C., Alberta, Saskatchewan, Manitoba, Quebec, New Brunswick, P.E.I., Nova Scotia and Newfoundland and Labrador.

73% of egg farms surveyed used ground well water sources, while 18% used surface water sources such as rivers and 9% used municipal water sources. Conductivity of all water samples was satisfactory, with 92% of water samples falling within the recommended pH levels set out by the Canadian Guidelines for Drinking Water. Only 4.5% of samples were above the recommended maximum level of sulphate, and only six samples tested above the maximum recommended levels for sodium. Calcium and magnesium mineral levels were satisfactory, but researchers noted negative impacts could occur at maximum levels when sulphate concentrations are high.

Using the range of mineral content and pH levels found in the water samples, researchers then developed trials to measure the effect of varying minerality and pH levels in water on Lohmann LSL-Lite white hens.

During the first trial, hens from 33–69 weeks were randomly assigned water treatments that varied magnesium levels from high to very high above recommended levels. Some treatments combined high levels of magnesium with high levels of calcium. Well water was used as a control.

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The second trial used the same well water control, but compared high and very high levels of magnesium with high and very high levels of calcium. In this trial, hens consumed water treatments from 7–46 weeks of age.

Lastly, in a final trial, hens from 20–52 weeks of age were randomly assigned water containing five different pH treatments, varying from pH levels of 6.1 to 9.2. Sodium hypochlorite was used to increase the pH and acetic acid was used to lower the pH.

Findings

For the first trial focusing on magnesium, none of the treatments resulted in a significant difference in body weight when compared to the control well water. Water consumption was higher for hens given the control well water compared to hens given the varying degrees of magnesium levels, except for hens given water with very high levels of magnesium and high levels of calcium, where consumption was the same. Bone quality and strength were not affected by mineral levels. Higher mineral levels in water did not affect feed consumption, egg production or egg quality during the trial.

In the second trial, pullets (7–18 weeks of age) tolerated high levels of calcium, magnesium and sulphates without any negative impacts on water consumption and body weight. While feed consumption was affected during weeks 15–18 of age, body weights were not reduced. Pullets consuming the very high magnesium water treatment consumed less feed than the pullets on the other treatments. During early to peak egg production, no impacts were found on feed consumption, water consumption, body weight, egg production and egg quality.

For the pH level trial, the pH value of hens' drinking water did not affect feed consumption, body weight, egg production or feed conversion efficiency of the laying hens for the duration of the trial. The pH of the water treatments did not affect egg quality except for egg shell breaking strength, where egg breaking strength increased for hens who consumed water with the highest pH level.

Conclusions

Water differs across Canada: the country-wide water quality survey revealed a variety of pH and mineral levels. As the results from subsequent trials showed, hens at all stages of production tolerated higher concentrations of magnesium, calcium and sulphates than previously recommended without negative effects. Results also showed that a broad range in water pH levels did not have an adverse effect on hens' production performance.

Updating research to reflect country-wide realities and new genetic strains of laying hens is essential to help inform best practices. As this research shows, variance across Canada can set the stage for important, innovative questions and lead to results that can be directly applied on farm.

About the researchers

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