

Supplementation solution for better egg shell quality

The egg shell plays a key role in protecting the egg against physical damage and microbial contamination. A good egg shell is a critical point in egg production for both the table-egg and breeding industry. As for the embryo, the egg shell provides protection from mechanical damage, contamination of the contents, and loss of water.

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The egg shell forms during the process of bio-mineralisation in the uterus of the hen and is, therefore, the final step of egg formation.

This process involves calcium and carbonate ions, which are secreted into the uterine fluid. Indeed, the shell consists of 95% calcium carbonate, in other words 4.5-5.7g of calcium carbonate is needed for a shell weight of 5-6g.

The calcium intake of laying hens comes exclusively from the diet, but it is estimated that between 30-40% of the calcium in the shell actually comes from the skeleton of the hen. Due to the time difference between feed intake (during the day) and the synthesis of the egg shell (in the night), the formation of the egg shell requires an important metabolic effort for the hen. This can lead to bone mineralisation failure, which is

still hard to diagnose and can reach up to 5-15% of production.

This issue increases with the laying hen age because of the alteration of the structure and the size of the shell crystals.

This egg shell issue causes a big quantity of downgraded eggs including:

- Broken eggs.
- Cracked shell.
- Soft eggs.
- Ring eggs.
- Colour shell problems (two colours).

The failure of the structural strength of the egg shell is correlated to a lower permeability of the egg. That increases the risk of contamination of eggs with harmful bacteria. This will affect:

- Final consumers of table eggs.
- The chick quality of breeder eggs.

The overall consequence is a decrease of economic performance on farms, due to a lower number of sold eggs or chicks.

Many factors impact on egg shell quality – from genetics to sanitary issues – as well as the nutritional program.

At the level of nutritional and farming management, egg shell problems are closely linked to the following points:

- **Pullet management:** Precocity (unfinished growth, ossification), feed intake, stress management.
- **Layer management:** Feed and water intake, homogeneity.
- **Feed management:** Feed particle size.

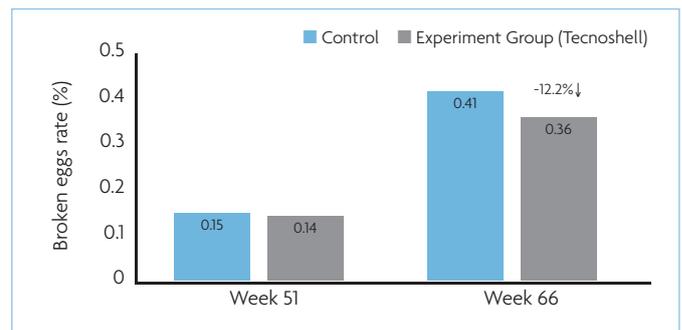


Fig. 2. Effect of dietary supplementation.

● **Nutritional levels of the feed:** Ca and P levels and balance, electrolytes and vitamin levels.

● **Calcium sources:** Raw materials quality and particle size.

Nutritional strategies can help to deal with egg shell quality problems, including:

- Adapt the mineral levels, both in quantity and quality, to the age and needs of the pullets and hens.
- Provide specific ingredients to support the mineralisation.

All these adjustments should be done throughout the life of the laying hens.

Field trial

MiXscience has developed a solution, Tecnoshell, which is a specific blend of active ingredients. Many trials have been performed to prove the mechanisms of action of

this in feed solution. A field trial has notably been conducted on a commercial farm in France.

The protocol was designed for the same barn and divided into two groups:

- Control with no supplementation.
- Experimental Group (with Tecnoshell at a dose of 2kg per ton of complete feed).

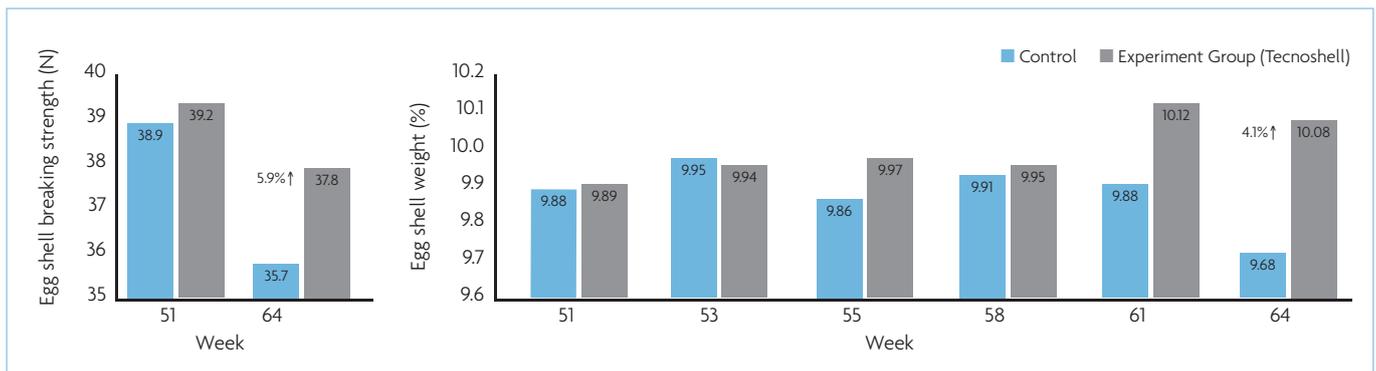
Hy-Line Brown laying hens (20,000) were fed for 18 weeks, from 50-68 weeks of age.

In order to evaluate the egg shell quality, two criteria were measured: egg shell breaking strength and egg shell weight. The birds fed with Tecnoshell had their egg shell breaking strength significantly higher than the Control ones.

In comparison with the Control group, the egg shell weight of the Tecnoshell group was improved by 4.1% (Fig. 1).

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Fig. 1. Effect of dietary supplementation on egg shell quality of laying hens.



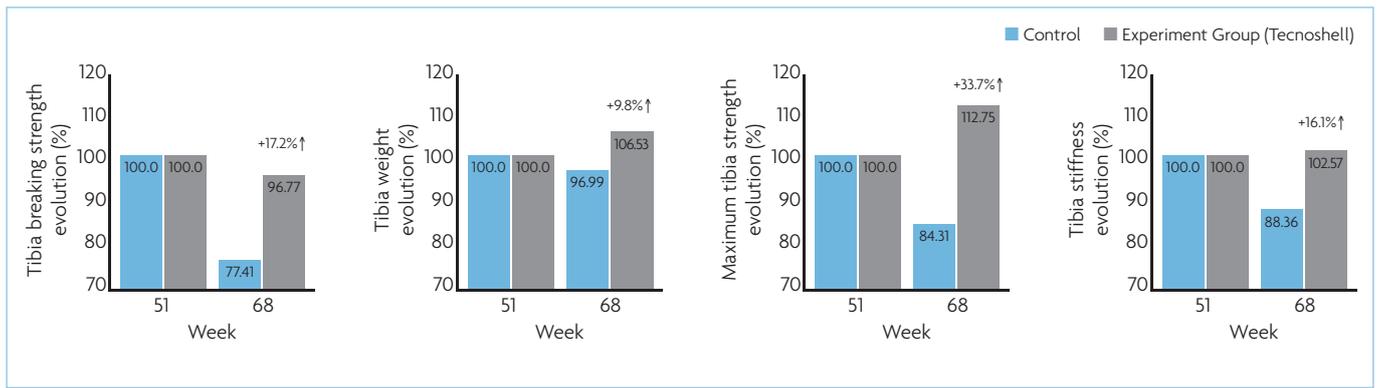


Fig. 3. Effect of dietary supplementation on bone mineralisation of laying hens.

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Based on these results, we can say that Tecnoshell provides a better egg shell quality.

In addition, we also measured the rate of broken eggs (Fig. 2). The normal phenomenon of the broken egg rate increasing with age is, indeed, observed in both groups but seems to be limited by the incorporation of Tecnoshell: the Tecnoshell group showed a reduction of 12.2% of broken eggs rate compared to the Control group.

Good calcium mobilisation from the bones is very important to avoid egg shell defects and ensure bone health. Four criteria have been

measured on the laying hen's tibia to characterise bone mineralisation:

- Breaking strength evolution.
- Maximum strength evolution.
- Weight evolution.
- Stiffness evolution.

The experimental group showed an increase of these four criteria of 17.2%, 9.8%, 33.7% and 16.1%, respectively, compared to the control group (Fig. 3).

This trial illustrates that Tecnoshell supplementation can improve the bone mineralisation status of laying hens, the egg shell quality and reduce the number of broken eggs.

To manage egg shell quality MiXscience has also created

Eggoscope, a software for farmers or integrators, aiming to manage the egg shell quality directly on farm.

Eggoscope is a practical tool meant to be used in addition to the Tecnoshell solution. This tool contains an electronic egg which helps to diagnose the critical points in the egg production process.

Conclusion

In conclusion, many factors can affect egg shell quality. The best strategy to maximise the egg shell quality is to adopt a holistic approach, from day one to

the end of the laying hen's life, including farm management and a fine-tuned nutritional program.

A great knowledge of raw materials and nutritional requirements is the key to prevent the risk of disease.

Feed supplementation with a specific active ingredient, like Tecnoshell, can also be beneficial to ensure good egg shell quality after the peak of production. ■

References are available from the author on request

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