Volatile fatty acids improve performance and quality

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Performance of egg laying birds decreases during the production cycle. The number of produced eggs is decreasing and also the number of saleable eggs is decreasing, due to a decrease in eggshell quality.

New research showed that this decrease in performance could be minimised.

The role of volatile fatty acids

As the hen becomes older, more and more fat accumulates in the liver.

This is mainly caused by an oversupply of feed, in particular that of energy.

The increased fat level in the liver reduces liver function, by damaging liver cells. Volatile fatty acids play an important role by restoring the function of the damaged cells.

Research has shown that VFAs, in particular butyrate, facilitates DNA repair enzymes. This means that butyrate contributes to repair the damaged liver cells.

It is also known that butyrate stimulates hormone secretion and it improves the protein synthesis in the cells.

Indirectly VFAs also stimulate epithelial growth of the intestinal wall, so that a better recovery of damaged cells in the digestive tract wall can also take place.

Second half of laying period

Older hens require a higher demand of volatile fatty acids than younger hens (second half of laying period). The cells of the intestinal wall are more damaged by older hens.

To repair this damage, it requires more and more VFA's as an energy source. As a consequence, less and less VFAs are available for the liver.

In combination with the higher fat content in the liver, the function of the liver is significantly decreased in older hens.

Eggshell quality

During the second half of the laying period the percentages of cracked and/or broken eggs is increasing.

In general an increased egg weight and consequently a larger surface, a reduced calcium adsorption from the feed and a decreased deposition of calcium in the skeleton are mentioned as the most important factors affecting the eggshell quality in older hens.

Table 1. The effect of the addition of 1kg of Provimax per ton of feed on the productivity results of laying hens (average age of hens, 60 weeks).

	Control	Provimax
Laying percentage (%)	83.4[a]	85.6[b]
Egg weight (g)	62.2[a]	63.1[b]
Egg mass (g/h/d)	51.7[a]	53.9[b]
Feed consumption (g/d)	106.7	107.4
Feed conversion	2.06[b]	1.99[a]

[a,b]Average values within a row with a different superscript vary significantly (P<0.05)

	Control	Provimax (1000ppm)
Production (%)	79.8[a]	82.2[b]
Egg weight (g)	65.5	65.2
Egg mass (g)	52.3[a]	53.6[b]
Feed intake (g/d)	98.0	98.5
Feed conversion	1.88[a]	1.85[b]
Hairline cracks (%)	46.0[a]	19.5[b]

[a,b]Average values within a row with a different superscript vary significantly (P< 0.05)

Table 2. Effect of Provimax on performance and hairline cracks in eggs of laying hens (50-66 weeks of age). B. F. Martinez et al. (2003) from the Universidad Nacional Autonoma in Mexico.

Effect on layer performance

At the Provimi research farm, De Viersprong, experiments have shown that an addition of VFAs in the layer feeds, during the second part of the laying period, improves the laying performance.

These studies showed that VFAs have a positive effect on egg production (laying persistency) and on the eggshell quality. The hypothesis is that the volatile fatty acids have a positive effect on the function of the liver and also on the quality of the intestinal wall.

Due to this, calcium adsorption and calcium metabolism might be improved. This research of dietary VFAs has led to the development of a product, known as Provimax, which is a blend of VFA's.

In the tables, results of experiments are given, one carried out at Provimi's research centre De Viersprong (Table 1) and one carried out at Universidad Nacional Autonoma in Mexico (Table 2).

Both experiments showed that the addition of 1kg of Provimax per ton of layer feed improved production of eggs.

In addition, the trial in Mexico also showed a significant improvement in the eggshell quality via a reduction in the number of eggs with hairline cracks from 46% in the control group to 19.5% in the Provimax group ($p<0.05$).

This positive effect of Provimax on the eggshell quality was also shown in another study carried out at the ITH, Kitzingen, Germany (Table 3).

The results presented in Table 3 clearly show that the hens fed the diet with Provimax not only produced more eggs, but also these eggs were of a better quality. The Provimax group has 1.3% less cracked and broken eggs than the control group.

Control	Eggs	Cracked (C)	Broken (B)	C + B	(%)
73-76 weeks of age	23.810	1.642	317	1.959	8.2
77-80 weeks of age	21.035	1.447	280	1.727	8.2
Total	44.845	3.089	597	3.686	8.2
Provimax (1000ppm)	**Eggs**	**Cracked (C)**	**Broken (B)**	**C + B**	**(%)**
73-76 weeks of age	24.022	1.609	202	1.811	7.5
77-80 weeks of age	21.376	1.026	282	1.308	6.2
Total	45.398	2.635	484	3.119	6.9

Table 3. The effects of the use of Provimax on the number of cracked and broken eggs in laying hens between 73 and 80 weeks of age. Experiment at the ITH, Kitzingen, Germany (Damme and Van Vugt, 2004).

Conclusion

The results of the above mentioned experiments show that the addition of extra VFAs in the feeds for layers and breeders contributes to better performance of the birds, both regarding laying percentage and eggshell quality.

Provimax

Provimax is a blend of VFAs and is marketed by Provimi. The inclusion rate is 0.1% in the final feed.

It is recommended to provide Provimax to layers and breeders during the second half of the laying period. In that case the optimal economical result will be obtained. ■