Organic egg production – how nutritionists and primary breeders can help producers to achieve better results

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Introduction

Consumers in Europe are increasingly prepared to pay more for food with a quality label, assuming that this food tastes better, is healthier for them or is produced on farms certified for improved animal welfare and/or protection of the environment. For example, in Germany average consumers spend less than 11% of their available income for food, and discounters are trying to increase their margins by offering a choice of organic food with various “Bio” labels.

The share of organically produced eggs in Germany has been steadily increasing in recent years and reached more than 7 % in 2011. The increasing demand has not escaped the attention of primary breeders who are offering efficient laying hens for any kind of egg production system. To be sure, the regular white-egg and brown-egg strains bred by Lohmann have shown excellent results under different conditions, but the results on organic farms tended to be more variable, and there was an apparent need to assist organic egg producers with recommendations for optimal feed formulation and, if possible, laying hens adaptable to the limitations of organic feed.

Contacts between DEMETER, one of the leading associations in Germany promoting organic food production, and Lohmann Tierzucht GmbH as a primary breeder of modern laying hens started in 2008 to discuss whether and how organic egg production could be realized with commercial strain crosses developed for efficient egg production in conventional systems. Although the discussions were focused on adequate feed formulation, DEMETER made it clear that they were interested in offering their members (and other organic farming associations) commercial chicks from parents managed according to the strict specifications of organic egg production.

General considerations from the nutritionist’s point of view

Assuming affluent consumers prefer organic eggs and are prepared to pay for the higher price, the poultry nutritionist is challenged to design the “best possible” feed, introducing the restrictions of organic production in his matrix for least-cost feed formulation: no synthetic amino acids (mainly methionine) and no extracts from oil production (soya, canola, or sunflower), which are normally used as protein sources. Unfortunately, formulation of balanced feed for laying hens without essential sulfur amino acids (SAA) is quite difficult, because they need additional SAA to build and sustain their feather cover. The natural SAA content of conventional components is never sufficient to meet the physiological requirements of laying hens in rearing and production.

Alternative sources of essential amino acids

Instead of extracts, so-called cakes or expellers from oil seeds may be used. These are derived from cold pressed oil seeds and have a variable content of residual oil, always higher than in the extracts. Cakes and expellers always contribute cell-bound oil and additional energy into the compound feed. Linear feed programming would then suggest little or no added oil or fat, and as a result we would get a dusty feed structure, which is not desirable because this limits feed intake. Sometimes molasses is added to offset this effect, i.e. to bind the fine feed particles and to improve the acceptance of the feed.

In many cases the deficit of methionine in organic feed is being compensated by an excessive amount of crude protein, which means the hens need more organic feed to meet their SAA requirements. At the same time, the energy content of organic feed easily exceeds the recommended level (11.5 ME MJ/kg) due to the inclusion of oil cakes. Since the high energy level limits daily feed intake, the hens are unable to meet their SAA needs, which is a common cause of poor productivity, excessive mortality,

feather pecking and cannibalism. To minimize these problems, we suggest to include less oil cake in the ration in order to keep the energy level lower than in our standard recommendations for barn systems (11.6 – 11.4 ME MJ/kg) to stimulate higher feed intake. We are sometimes seeing encouraging results with even less than 11.0 ME MJ/kg in organic feed, but this should not be understood as the general target.

An additional advantage of low energy rations is also the higher content of crude fiber compared to high energy diets. We have seen flocks on low energy organic feed with up to 7% crude fiber which kept their feather cover much better than organic flocks on higher energy feed. Lignocellulose may also be used as a source of crude fiber in case other feed components contain little fiber. The demand for good organic feed cannot be me met by current production potential, and the quality of organic feed tends to be variable, especially due to shortage of sun flower cake. Due to its low energy content, this component is much more suitable for organic feed than soya cake or full fat soya beans which may be used as protein source, but obviously create problems in the nutrition of organic hens.

Organic feed and egg weight

Most flocks of laying hens start with more “small” eggs and often end with more “extra large” eggs than can be sold with a satisfactory margin. To maximize egg income over feed and other cost for the lifetime of a flock, producers of organic eggs must try to reach the preferred average egg weight as early as possible and keep it from increasing thereafter. If pullets for organic egg production are reared properly, most hens should have some “reserves” in body mass and appetite to develop quickly from “pee-wee” to “small” to “medium” egg size. A more common problem is that hens on organic feed continue to increase in average egg size, while consumers may not be prepared to pay a premium for large and extra large organic eggs.

For reasons explained above, organic flocks may consume as much as 130 g per hen per day or more, especially if they are poorly feathered and/or make use of the free range during times of low temperature. In this case egg size will increase beyond the marketable size, and there is no added egg income to cover the higher feed cost. Using oil cakes and full fat soya beans in organic feed will increase the linoleic acid content, with the known additional effect to boost egg size. Producers of organic eggs therefore prefer laying hens with a lower genetic potential for egg weight, e.g. Lohmann Brown “Lite” instead of “Classic”, and the introduction of Lohmann Brown PLUS is the next step in offering producers of organic eggs a combination of genetic potential and advice for fed formulation to maximize egg income over feed cost.

Lohmann Brown PLUS: genetic adaptation to support organic egg production

A long history of reciprocal recurrent selection has resulted in highly efficient lines with a desirable performance profile for most purposes and plenty of remaining variation to pursue new targets for special demand. The concept of developing sub-lines was already used in the 1960s to select for Marek’s resistance (Flock 1974) and repeatedly since then.

When Lohmann Tierzucht GmbH decided to cooperate with DEMETER, sub-lines were established from the best families of male and female lines of LB Classic and LB Lite, using a special index to increase feed intake and body weight. The first parents of this new strain cross were housed at the end of 2009 on the farm of Mr. Schubert near Erlangen in Southern Germany. So far, this is the only distributor in the EU who keeps Lohmann Brown PLUS parent stock under organic conditions and can supply commercial pullets to producers of organic eggs.

The first generation of commercial LB PLUS layers was not expected to deviate significantly from LB Classic layers in most traits, except being somewhat heavier. Hatching eggs from this first parent flock were entered in two German random sample tests as “experimental” entry. Results are shown in the following paper by Damme *et al.* (2012) in this issue. Meanwhile, selection for higher body weight has continued, and differences from LB Classic and LB Lite should become more obvious in the years ahead.

DEMETER would also like to see the males of this strain cross to be used for “ethical” poultry meat production, but the difference in weight gain and feed efficiency compared to slow growing broiler strains is too large to expect a significant demand for this product.

Zusammenfassung

Produktion von “Bio-Eiern”: Unterstützung durch genetische Entwicklungen und verbesserte Nährstoffversorgung

Die Nachfrage nach Bio-Eiern in Europa wächst offenbar schneller als die Produktion, und variable Praxisergebnisse sind eine dauernde Herausforderung für Fütterungsberater. Seit 2009 bietet Lohmann Tierzucht GmbH Unterstützung für Biobetriebe nicht nur durch Fütterungsberatung, sondern auch eine speziell für Bedürfnisse der Biohaltung angepasste Linienenkombination unter dem Namen Lohmann Brown PLUS an. Seit 2010 bietet der Vermehrungsbetrieb Schubert Küken und Junghennen aus Elterntierherden an, die nach den Richtlinien von DEMETER gehalten werden. In diesem Beitrag werden Probleme optimaler Nährstoffversorgung für Hochleistungshennen ohne synthetische Aminosäuren erklärt und Empfehlungen für die Formulierung von Biofutter gegeben. Bei Einhaltung der Richtlinien von DEMETER kann der Bedarf essentieller Aminosäuren nur annähernd gedeckt werden, wenn die Hennen genügend Futter aufnehmen. Selektion auf höheres Körpergewicht und niedrigerer Energiegehalt des Futters sind die beiden Hebel, die Genetiker und Fütterungsexperten in enger Zusammenarbeit mit der Praxis ansetzen, um die Legehennenhaltung zur Produktion von Bioeiern zu erleichtern.

Literature:

Damme, K., I. Simon and D.K. Flock (2012): Adaptability of Laying Hens to Different Environments: Analysis of German Random Sample Tests 2010/11 with floor management and enriched cages. Lohmann Information 47 (2),

Flock, D.K. (1974): Recent results on advantages of reciprocal recurrent selection (RRS) within split populations of White Leghorns strains. Proc. 1st World Congress on Genetics Applied to Livestock Prod., Madrid I, 925 – 930.

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