Botanical supplements: effect on breeder and chick performances

Breeder farm management is a critical stage of poultry farming that must consider the performance of breeders and their progeny. The main objective of breeder management is to produce the greatest number of fertile eggs per hen, optimising hatchability rate and producing resistant chicks.

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Fertility and hatchability rates are two major parameters that influence the supply of day-old chicks. Usually, fertility refers to the percentage of incubated eggs with embryo development, and hatchability is the percentage of fertile eggs that hatch.

During and after egg production peak, performance and fertility can be reduced for breeder hens. Many studies show that free radicals leading to lipid oxidation and chronic inflammation play an important role in this process.

The hatching process is considered to be a time of oxidative stress. Therefore, Surai et al. 2007 showed that improvement of antioxidant defences during embryonic development can increase hatchability.

Breeder feed requires specific supplementation in vitamins and minerals to ensure breeder performance. However natural antioxidants offer a complementary approach to enhance them.

Potential of botanical compounds on fertility and hatchability

Dietary supplementation of natural antioxidants is a common approach to improve the antioxidant status in organisms. Plants produce a huge diversity of polyphenols, flavonoids, and carotenoids that can be used as exogenous antioxidants by animals, particularly in case of environmental or physiological stress.

For example, turmeric or rosemary are two popular plants rich in antioxidants. The beneficial effect of turmeric has been previously reported to improve semen quality and fertility rate in aged breeders.

A significant result was recorded for semen concentration, production, motility and plasma membrane integrity.

Moreover, carnosic acid and rosmarinic acid are two major phenolic compounds present in rosemary leaves with complementary antioxidant properties. Borghei-Rad (2017) showed that rosemary leaf powder could beneficially affect semen quality and fertility rate of Ross 308 breeders.

Standardised plant-based solution

The French company Phytosynthese has more than 25 years' experience using natural active substances to develop phytogenics and offer effective, natural solutions to all players in the animal feed sector.

The Phytosynthese supply chain, in collaboration with its worldwide supply partners and its laboratory of phytochemistry, is able to select and approve bioactive concentrations of each batch of products, with a strict monitoring of undesirable substances.

Certified by FAMI-QS, Phytosynthese is increasing control and procedures. Recently, the company conducted a study to evaluate the effects of supplementation of botanicals with antioxidant and immunostimulant properties on breeder performance and chick quality improvement.

A natural solution (PhytoAx'Cell) contributes to support natural defences during stress periods. This unique product combines the active components of green propolis (Artepillin-C) with selected plants rich in polyphenols and alkaloids.

The experiment consisted of two groups of 360 females from 30 weeks. One group with control feed without supplementation, and another group with PhytoAx'Cell in feed from week 30 to week 40.

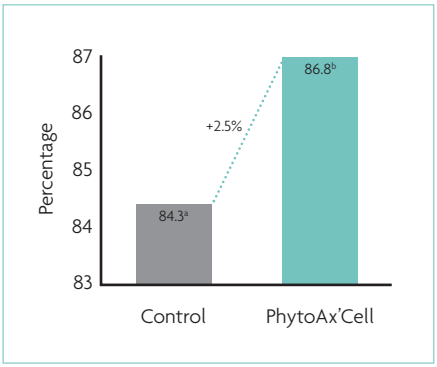
Each group was divided into 15 repetitions of 24 females. 56 males per group were supplemented. Artificial insemination was carried out and the same feed was distributed for males and females.

Some 2,400 eggs per treatment were taken to measure fertile eggs rate and hatching eggs at week 35 and 40.

Regarding breeder performance, fertile eggs during the trial were significantly increased. At week 35, 86.18% for the PhytoAx'Cell group and 84.3% for the control group as you can see in Fig. 1.

Hatching rate value was 84% for the PhytoAx'Cell group and 82.5% for the control group (p=0.049).

Fig. 1. Percent of fertile eggs at week 35.



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Immunity transfer to chicks

At hatching, the chick's immune system is still immature and will gradually develop during the first weeks of life. Maternal antibodies are transferred from hens to the chicks via the egg. Protection by maternal antibodies continuously subsides until about two weeks post hatch and the chick has to rely on its own immune system (Fig. 2).

Data indicates that increased supplementation of some natural substances to the maternal diet can substantially increase developing chick tissues.

The immunomodulatory effects of natural substances have been considered as an interesting alternative adjuvant to supporting immunity of breeder transfer to chicks. Several studies have reported green propolis to have immunomodulatory and antioxidant activities. Green propolis is produced by Apis mellifera honeybees that utilise Baccharis dracunculifolia, a common species found in the Brazilian cerrado. The typical active molecules of Brazilian propolis are artepillin C and baccarin. Studies demonstrate green propolis have local and systemic anti-inflammatory action resulting from an immunomodulatory action.

Robustness of chicks

Chick viability is an important factor determining the profitability of the poultry industry. In contrast to mammals, broiler embryonic development takes place in eggs, where only exchange of gas and water takes place. The success of embryonic development depends on egg composition and conditions of egg incubation.

Therefore, a great body of research indicates that avian maternal nutrition is the major determinant of the health and development of the progeny. Egg composition is designed in such a way that all nutrients necessary for the development of the future embryo are accumulated within the egg yolk and white. Amongst different nutrients in the maternal diet

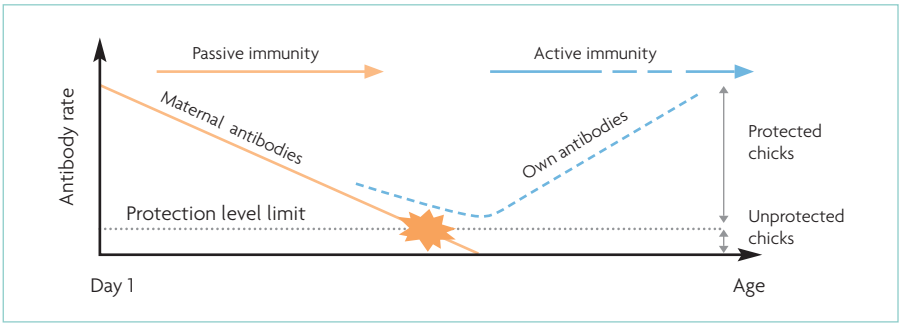


Fig. 2. Antibody rate of chicks during the first days of life.

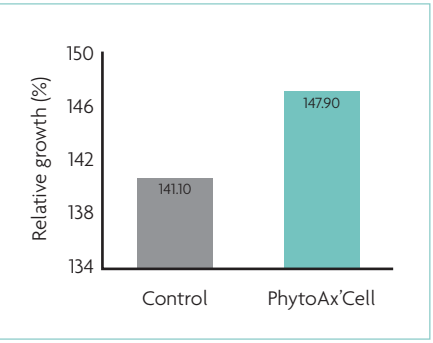
which could significantly affect chick embryo development and their viability in the early posthatch life, natural antioxidants have been suggested to play a central role. The development of the chick embryo is associated with the accumulation of highly polyunsaturated fatty acids within the lipids of several embryonic tissues. This makes embryonic tissues highly sensitive to lipid peroxidation and free radicals throughout the hatching period.

The integrated antioxidant systems in broilers is responsible for protection of polyunsaturated fatty acids, protein and DNA from the damaging effect of free radicals to their metabolism.

In a recent study with PhytoAx'Cell, growth of 500 chicks per treatment was calculated between day 0-7 on eggs laid at week 35 and 40, and also mortality at day seven. Blood samples were conducted on 12 chicks to quantify immunoglobulins. Immunoglobulins are transferred by hens via egg yolk and go in the blood flow of the embryo to support immunity of the future chicks.

From this study, we observe a significant higher growth of chicks (+6%) (Fig. 3). Average IGG quantity in chick blood was 3.21g/l for chicks coming from parents supplemented with PhytoAx'Cell against 2.81g/l for the control group.

Fig. 3. Relative growth of chicks from day 0-7 in eggs from week 35.



Conclusion

Hatcheries play a strategic role in breeder production. Optimisation of breeder farm management can lead to improved results throughout the broiler production chain.

The developing embryo and the hatched chick are completely dependent for growth and development on nutrients deposited in the egg. Consequently, the physiological status of the chick at hatching is greatly influenced by the nutrition of the breeder hen.

Botanical compounds rich in antioxidant and phyto compounds selected to stimulate an organism can offer a complementary approach to maintain breeder production and to enhance chick performance; such investment in parent stock is profitable for all operators of the broiler industry. ■

References are available from the author on request