

The impact of genetics on breeder management

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Introduction

In the world of broiler meat production, developments go quickly. The increase in broiler performance for all commercial breeds has been tremendous over the years. This performance is not only measured in growth per day, but also in feed conversion, carcass yield, breast meat yield, mortality, leg quality etc. The trend in breeder performance is not so much outspoken positive. Although at this moment modern breeders can produce peaks of 85% and more, strict management must be applied to get these results. We need to control the birds much more strict and don't allow any mistakes to get the birds in good production. The reason for that is rather simple. When we look at the cost price of a kg live broiler, so even without processing, the cost of the the day old chick is only approximately 15% of that total cost price, where 85% is the cost of growing that day old chick into a broiler. If we calculate the cost price of a kg of meat, so we include the processing costs, the cost of the day old chick is only 10% of the total cost price.

This means that the costs of rearing breeders, feeding and housing them, incubation, chick processing etc only adds up to 10-15% of the total cost, and therefore that an improvement in breeder performance has a relative small influence on total cost price. This means that improvement in broiler performance is much more important then improvement in breeder performance. Improvements in breeder performance is only allowed if it does not or hardly affects the broiler traits. This is why most breeder companies in the long term try to keep their breeder performance equal to slightly positive, instead of having enormous improvements in breeder productivity with consequently negative impact on the broiler.

Although all breeding companies are aware of this and are effective in achieving further improvements in performance, not all companies look at the key points for improvements in the same way. Between companies and breeds we see differences in performance, based on the importance that the individual companies give to certain aspects of broiler production. Breeding is a long term business, it takes at least 4-5 years to see a change in pure lines being reflected in product performance in the field. Therefore it is important to have a clear view of the direction in which the markets in the future develop, and to anticipate in time on this development.

Multiple crosses

Broilers are the final product of crossings between several lines. This means that on the breeder level, the genetic background of males and females can be (and almost always will be) completely different. - This gives to some extent the possibility to realize broiler trends in the parent line of choice. For example, growth in a broiler can be realized by crossing a very fast growing male line with a normal growing female line, or vice versa. The type of package has an enormous impact on the reproduction characteristics, and on the management strategies that have to be applied to a certain breed. Lets assume broiler growth is obtained by crossing a extreme growing, genetically heavy male with a slow growing, genetically light female. As a result, it can be expected that this breed will easily produce eggs but fertility, especially at a later age in the flock, will be more difficult to obtain. When the reversed option is used, so a heavy female with a light male, fertility will be relatively easy to achieve but number of eggs will be more challenging. It is obvious that the actual management and the focus of the management for these two breeds will be different.

Selection goals and their influence on breeders

The breeding program for each individual line in a breeding company is defined in breeding goals. In other words, for all lines a selection program is defined that describes on which parameters the focus must be for that specific line.

Of course breeding companies do not only select on growth, but also on yield, meat quality, feed conversion, mortality etc, as well as on breeder traits like egg production, shell quality, hatchability etc. The problem with selection is that it not only changes the parameters that the birds are selected on, but also parameters that at first sight do not have too much to do with the selection goals. A good and well known example of that is the relation between growth and reproduction. It is well known that a strong selection on growth has a negative influence on reproduction performance. This means that relative more pressure has to be put on selection for reproduction if at the same time more pressure is given to selection on growth, in order to keep reproduction constant or even increasing.

However, also selection on yield and feed conversion has an influence on reproduction. If high yielding, efficient feed converting birds are stimulated too early and too much with feed without being

able to produce the expected eggs, the birds will put that extra feed in their own body and grow excessive meat very rapidly. This meat influences the production of sexual hormones in the birds, and as a result the birds are getting over-stimulated. This results in poor production and high mortality, because the birds cannot handle the high stimulation of the reproductive tract.

If we take reproduction and growth as an example, we can question what causes the negative correlation that is mentioned so often. There are 2 main reasons, it can be either related to the individual hen or to the performance of the flock.

- Individual birds

Egg production of an individual hen is maximal if a follicle (yolk) is produced every 24 hours, turned into a first grade quality egg and laid. This will mean an egg per day so 100% production. When we do select on growth, it is getting more difficult for a bird to produce that follicle in that ritme. Often it will take the hen longer then 24 hours, and often a pause day (day without an egg) will be introduced. This will be because the hormonal or developmental sequences in the bird will not be as optimal as it should be. It is not so much that the optimal sequence cannot be reached anymore, but the circumstances to get the birds into that condition are getting much more critical. The same holds for the persistency of that bird, how long can it hold that high level of follicle production without getting into more pause days.

- Flocks of birds

Ofcourse a flock of birds is a mix of thousands of individuals, each with their own individual capacity to lay eggs, but also with their own demands on the environment to get into that optimal stage of development for producing an egg every 24 h. Due to the selection on broiler traits, the correct stage of development and the fine tuning to get to that stage is getting more and more crucial. The bird is getting less forgiving for non-optimal situations, and therefore less deviation from that optimal stage is acceptable to obtain good results. As big flocks of birds will show a natural variation in development, the risk of non-optimal treatment for groups of birds is increasing. Every bird in the group is still able to produce, but as we manage the flock on the average demand of all birds, more and more birds will suffer from non-optimal circumstances. Factors that increase that natural variation in development (poor rearing, high stress, poor equipment, high disease pressure etc.) will make it more difficult to obtain good results.

Consequences for management

Selecting for fast growing, high yielding broilers influences for the reproduction capacity of the parent stock. To be able to obtain good reproduction results, we have to focus on adequate management to address the needs of this specific type of birds. This management deals specifically with certain key points.

Start of the flock

As individual birds accept less and less deviation from the optimal, it is crucial to have a very uniform flock at the onset of lay, to get as many birds as possible at that optimal. This is more than just uniformity in bodyweight at a certain age, as it includes also uniformity in development. Getting maximum uniformity is also more then grading, it starts with a good chick quality and start up of the chick, uniformity in frame size, avoiding stress, diseases etc. Especially the start up period is very important. High-yielding broilers (and therefore their parents) are normally selected to have a high development of organs before the real growth starts, to be able to support the rapid growth of protein later in life. This increased development in the first days normally means that the birds tend to start rather slowly, and are more sensitive for especially temperature. We have to make sure that the house is sufficiently preheated before the birds arrive, to prevent them from becoming cold. If the birds are cold shortly after arrival, some of them will not find the feed and water for several days, and the uniformity is bad already after one week.

Quality of rearing

Even more then with classical breeds, the rearing period is crucial for high-yield breeders to obtain maximum reproduction results. Focusing on quality of rearing, uniformity of the flock and adequate development at start of production pays off very rapidly. The key word in rearing is being gradual. Don't change the feed amounts to rapidly, but try to gradually increase the feed every week. In the first period of rearing the weekly increase is 2 to 3 grams, later it changes to 3 to 4 grams. At the end the weekly increases will be 4 to 5 grams. It is very important that these weekly increases are steady and constant, to avoid jumping up and down too much. That sometimes means that even if the flock is a bit over- or underweight, we should not try to correct it too quickly, but try to anticipate on the development for the coming weeks.

Start of production

A crucial period in the development of high-yielding breeders is the onset of lay. Genetically, these birds are capable to produce high amounts of (breast)meat. Managing the amount of meat growth is

very important in obtaining good results. A certain amount of fleshing is needed, to avoid birds wanting to grow more meat to the cost of the eggs. However, over-stimulating with feed in this period to push the birds into eggs has a very negative impact, as the birds will grow meat very rapidly. This rapid meat growth will over-stimulate the sexual hormones and the reproductive system, resulting in poor production and high mortality. Especially in this respect, high-yielding breeds differ from more traditional breeds, as they are not so well capable of handling high stimulation with feed.

The best tool for controlling is checking the formation of the breast muscle on a regular base. We want to have a U shaped breast for optimal production. If a bird is underdeveloped, the breast will feel like a V, which means that there is not a lot of meat around the keel bone. If we over-stimulate the birds either in feed quantity or in protein, we will see that the breast muscle quickly develops in a W shape, which indicates over-fleshing. This over-fleshing will result in reduced production, more double yolks and an increased mortality. When the birds are well developed, make sure you don't over-stimulate them with a high amount of protein. To prevent this, increase the feed amount in a steady line from end of rearing to start of production, aiming at approximately 120 grams of feed at 5%, regardless of the age of the flock.

Peak feed

The genetic selection for growth also influences the management to be applied during the peak production phase. A strong selection on growth will allow the birds to grow very fast if the feed amount is not controlled well. This means that for fast growing breeds, the feed amount has to be reduced after peak more rapidly and aggressively to control their growth and maintain persistency and hatchability. Start with the feed reduction as soon after peak as possible. If not, birds will gain weight on the excessive feed that is given and then they need extra feed to maintain that extra body weight. A good standard is to reduce feed amounts one week after the peak production is reached. Reduce the feed for three weeks with approximately 2 to 4 grams a week, divided in two feed reductions per week. After each feed reduction, monitor egg weight, body weight and production. Both egg weight and body weight should still increase, and production should not decrease more than 1% per week. Only if that is achieved, introduce the next feed reduction. After these three weeks of feed reduction, continue to reduce the feed with 1 gram per week until about 45-50 weeks. From there on, it is often advisable to maintain the feed constant. The aim of this whole feed reduction must be to keep the bodyweight after peak increasing at a level of about 10 g per week. This is not because the birds need to grow 10 grams a week, but if the flock grows on average 10 grams, the poorest birds will at least not loose weight.

Conclusions

Changing the characteristics of birds by genetic selection has an influence on the capacity of the birds to reproduce. Not only selection on growth, but also on meat yield and feed conversion has, among others, a negative impact on reproduction. This can be partly recovered by putting more selection pressure on reproductive performance, and partly by adjusting the management to the specific birds. Applying classical flock management conditions to fast growing, high yielding breeds will not automatically give the highest production results. Continuous adjustment and fine tuning of the management to deal with the continuous genetic changes in the birds is necessary.