EURCAW
European Union Reference Centre for Poultry and other small farmed animal

Question to EURCAW-Poultry-SFA

Reference of the query: Q2E-EURCAW-Poultry-SFA-2022-004
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Background context provided by the solicitor

The query is on the welfare consequences of the moulting process in ducks.
The ducks start to lay at 6 months of age at a weight of approximately 1.5 kg. The lay last 9 to 15 months before the keeper moults the birds when laying number drop to 30-40%. The moult is initiated by suddenly stopping ad lib layers pellet feeding and going onto oat feeding at 120 g per duck twice daily. However, it cannot be excluded that only 120 g per duck fed once daily can be applied. The moult starts within 3 to 4 days after change in feed, last 6 weeks, and takes place once a year.
Ducks age on the precise case described here ranged from 2 to 5 years old but are kept approximately 3 years usually, according to the keeper. They have daily access to an outside paddock with limited enrichment. During winter, the ducks are provided with supplementary artificial lighting up to 16 hours per day.
10 random ducks were weighed on site and they weighed between 1.5 and 2.4 kg. Body condition scores were very poor between 1 to 2 on 5.

Questions from the requestor:

1) Is feeding of 120 g oats twice daily (once daily in this case was clearly insufficient) sufficient to meet their physiological needs, given that moulting is a time when there is increased energy and protein demand (albeit a forced/ induced moult)? Is it enough to cover the physiological needs? Will birds feel prolonged hunger?
2) Can ducks be fed once or twice daily without provoking prolonged hunger and other welfare consequences or should be fed continuously?
3) What are the immediate welfare consequences when the food type and quantity are suddenly changed?
4) Is induced moulting in ducks a normal practice in other MSs?
5) Is enrichment commonly provided for laying ducks in other MSs?

Level: Husbandry

Type of production: Laying ducks

Answer

1. Introduction

Following the reception of the present query, EURCAW Poultry-SFA launched a survey to the Competent Authorities to collect information on the practices in induced moulting in laying ducks and on the provision of enrichment materials in the MS. Seventeen answers were retrieved in which only four (requestor included) declared production of laying ducks in their country. However, induced

moulting seems to be only performed in one of them where it is a routine practice and in another one, exceptionally, in periods of severe avian influenza. In the case of Avian Influenza and high mortality in duck breeders, moulting is practised to cover the lack of available breeders. On the other hand, only two Member States provide enrichment material to laying ducks (i.e., bathing water, straw).

There are gaps of scientific knowledge concerning the welfare consequences of feed deprivation and induced moulting in ducks. However, as feed deprivation is a current practice in other species such as broilers breeders, turkeys breeders and laying hens, welfare consequences on these birds are well known and can be extrapolated to ducks. To avoid health problems related to rapid growth in broiler chickens, feed allocations during rearing could be 60 to 80% less than broilers would consume in *ad libitum* and 25 to 50% less during the laying period (Mench, 2002). During feed restriction, broiler breeders are chronically hungry, and several indicators show welfare problems such as elevated levels of corticosterone or aggressive behaviours (Mench, 2002). However, the provision of insoluble fibre sources can decrease plasma corticosterone concentrations in feed restricted female broiler breeders (Moradi et al., 2013). Nevertheless, a study from Van Blois et al. (2019) showed no evidence of stress on food restricted meat ducks (15% and 35% feed restriction). In turkeys (male-line), restricted feeding causes behaviour changes, such as increased oral activity and decreased time spent sitting (Hocking et al., 1999). The welfare consequences of food restrictions in the context of moulting could also depend on the moulting methods. In laying hens, food deprivation for 10 days following by 18 days of cracked corn diet *ad libitum increases* corticosterone levels and reduces the antibody production in comparison with two others diet (whole-grain barley diet or high dietary Zn; no deprivation period) according to Onbasilar and Erol (2007). Then, the welfare issues for laying ducks are probably related to the moulting method and diet. Two important welfare consequences of duck moulting is prolonged hunger and, thermal stress when plumage coverage is impaired because of moulting. Injuries due to competition for feed, can also appear.

2. Welfare consequences for ducks welfare associated to moulting

2.1. Prolonged hunger

Prolonged hunger has been described as a craving or urgent need for food or a specific nutrient, accompanied by a negative affective state, and ultimately leading to a state of weakness as an animal's metabolic needs are not met (EFSA, 2022).

Commercial feed for farmed animals is designed to provide the average nutritional requirements to the animal (specie and breed) according to the production stage. For this, it is of utmost importance to consider not only the energy content but also the protein, vitamins and minerals content and profile. In case of protein, it is of interest to know how much of the protein is digestible, the amino acid profile and digestibility and in regard of the energy, how much is digestible and metabolizable.

It is noteworthy that plant-based feedstuffs are very low in essential amino acids and low in calcium. In addition, phosphorus is stored as phytate and, therefore, form insoluble complexes through its strong chelation with Ca, Fe, and Zn and, hence, contributing to lower their digestibility and absorption and mineral deficiency. In addition, plant-based feedstuffs not only contain many other endogen antinutrients that interfere with the absorption of nutrients but also contain a variable mycotoxin content. The animal feed formulator takes all into account adds essential amino acids, vitamin-mineral corrector and adds exogenous enzymes and process the feed to maximise the digestibility while

deactivating the antinutrients and lowering the mycotoxin content (reviewed in Hoffmans et al., 2022). Feed is intended then to fit the nutritional requirements without causing any collateral health damage to the animals.

Induced moulting is intended to stress the birds in order to induce stop of laying, undergo regression of the reproductive tract and loss of feathers in order to regenerate the reproductive tract so they can start a new laying cycle (Berry et al., 2003). Therefore, restriction on feed quantity and nutritional imbalance is aimed to induce moulting.

Commercially formulated diets for end of egg production curve in laying ducks are designed to contain 2,500 kcal of AME/kg and 17% crude protein (Fouad et al., 2018) where feed intake is approximately 250 g. This characteristics are aligned with the ones of the feed distributed in the farm supporting this query. Therefore, the animals are used to a daily intake of 625 kcal of AME. Actually, 240 g of oats provides 844 kcal of gross energy however, a major part of the gross energy will not be metabolized by the duck. Offering a total of 120 g of oats twice a day to laying ducks is estimated to cover much less than 50% (or less than 25% in case of once a day) of their energy requirements. Although fibre content can make certain bulk effect, the energy content of starch and fat from non-dehulled raw oats are less digestible than when technological processed as in pellets (i.e., milled and extruded, pelleted).

On the other hand, oats contain more protein than maize but less than wheat and barley, their amino acid profile is better than other cereals but still not sufficient. Hence, oats *per se*, cannot satisfy the high protein requirements of laying ducks not only to cover their maintenance needs but also to cover the protein they deposit on eggs and feathers. The low energy and protein provided to ducks makes them to catabolize their corporal reserves to satisfy their energy and protein requirements. Thus, it is not surprising that non-moult ducks have an average weight of 3.5 kg and induced-moult ducks' weight 1.5-2-4 kg at the same productive stage.

It occurs the same with Ca (calcium) requirements since 120 g of oats offered twice a day to laying ducks is estimated to cover much less than 9% of the Ca requirements. Furthermore, part of this Ca will not be absorbed because digestibility is lowered due to the phytates, and many other factors that interact negatively with Ca absorption. It is reported than an average eggshell weight at the end of the laying curve is around 7.5 g and the 85% of the eggshell contains Ca in the form of CaCO3 (Nimisha et al. 2020). In case any additional source of calcium is provided, it is estimated that laying ducks needs to mobilize 2.6 g of Ca from bone reserves to form the eggshell per egg laid. However, it is estimated that the quantity of oats provided per day (240 g) only contain 0.2 g of Ca. Since moulting does not cause immediate cessation of laying but a transitional period, the animal should mobilize approximately 2.4 g of Ca from the bones per egg laid. However, laying birds are able to adapt to lower calcium intake by sparing Ca through lowering the eggshell mineralization (Chen et al., 2015).

In any case, this is of welfare concern since it is well known that even in non-feed restricted laying birds, the older the animal, the bigger the egg laid and, therefore, the higher the calcium requirement and turnover and the more impaired skeletal integrity due to bone demineralization. In this sense, if calcium content in diet is dramatically lowered when inducing moulting, it causes a detriment on skeletal integrity making the birds even more prone to bone fractures than non-moulted laying ducks (Mazzuco and Hester, 2005a, 2005b).

Ducks are known to be sensitive to the beta-glucans content of oats but, especially, extremely sensitive to mycotoxins compared to other domestic fowls. Mycotoxins are secondary fungal metabolites that are present in raw grains of cereals in variable contents. They cause toxic effects in animals increasing the feed conversion ratio and lowering the kidney and liver relative weights of ducks (Peillod et al., 2021).

Taking all into consideration, an average of 240 g of oats per animal a day seems to be not covering the physiological needs of laying ducks at the end of lay which may confirm the animals are suffering from prolonged hunger.

In addition, prolonged hunger and frustration of the feeding motivation due to lack of feed cause behavioural changes (e.g., hyperactivity, stereotyped object pecking and over-drinking) and increase of haematological and hormonal indicators of stress (e.g., heterophil to lymphocyte ratio and elevated plasma circulating corticosterone) (VKM Report, 2022). When feed is not provided *ad libitum* and ducks are re-fed after a period of restriction, animals develop an aggressive behaviour aimed at winning a competition for the limited resources. Ducks pile up around feeders and jump on top of each other causing scratches on the dorsal area of the conspecifics due to their sharp claws. Scratches are expected to be more severe when the animal is already partially unprotected by its plumage, as in the case of moulting ducks. In addition, this competition for limited feed is expected to cause some individuals to manage to eat more than the calculated 120 g of oats per bird to the detriment of others who will end up eating less than the expected amount.

2.2. Thermal stress

Thermal stress is defined as stress and/or negative affective states such as discomfort and/or distress when exposed to either low or high effective temperature (EFSA, 2022)

Moulting induces changes in length and weight of feathers and a progressive loss of down, contour feathers, remiges and rectrices (Vargas et al., 2020). Plumage does not serve only for flying purposes but also acts as an insulate cover to the skin to protect the skin from sunburns, abrasions and to maintain thermal comfort. When exposed to cold weather, ducks adopt behaviours such as fluffing their feathers to trap air between them and their skin. This prevents heat dissipation and preserves warm air that rises their body temperature (Mota-Rojas et al., 2021). Therefore, featherless areas are a critical region when birds are raised with outdoor access especially in cold weathers. Compensatory mechanisms for hypothermia avoidance include shivering thermogenesis which also increases the body energetic demand in a situation of negative energy balance in moulting ducks. In addition, cold stress is known to decrease the ability of animals to fend-off diseases and to cause increased mortality when the animal is not able to cope them.

3. Conclusions

1) Scientific studies on laying ducks welfare and better practices when moulting is induced are lacking. Feeding laying ducks with 120 g of oats per animal twice a day is (intentionally) not sufficient to cover the physiological needs of laying ducks. Indeed, the objective of moulting is to stress the birds and induce stop of laying and loss of feather in order to induce a new laying cycle. This unsuitable diet may lead to several welfare consequences such as prolonged hunger, aggressive behaviours (fights), injuries and cold stress related to feathers loss.

2) It is hard to determine the sufficient number of meals per day or if *ad libitum* food is needed to prolonged hunger because it is more the composition (nutritional content, fibre source) of the food that will matter. Clearly, two meals is better than one but it is likely that two meals of 120 g oats a day is anyway leading to prolonged hunger.

3) The immediate welfare consequences to sudden changes of food type and quantity in the present case is prolonged hunger. Additionally, it might lead to competition for resources leading to injuries in between birds. The loss of feathers can also expose birds to cold stress. In order to have a general overview of the welfare, it is recommended to assess the welfare of the ducks using a holistic approach. Hence, animal-based indicators to assess prevalence of emaciated animals, animals with scratches, bone fractures, changes in mortality of the flock and animals' behaviour (e.g. huddling because of cold stress) along with increase of corticosterone and heterophil to lymphocyte ratio can be used to determine the impact of this moulting method on laying ducks' welfare, especially at advanced ages.

4) Induced moulting in ducks seems not to be a current practice in European Member States. However, only four Member States on seventeen were having production of laying ducks for table eggs.

5) Only two Member States indicated to provide enrichments to laying ducks. Yet, providing environmental enrichments (e.g. coloured plastic balls or access to outdoor swimming pond) may improve feather quality, duck welfare and health status in ducks (Colton and Fraley, 2014; Farghly and Mahmoud, 2018).

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