The interrelationships of nutrition and feather pecking in the domestic fowl – A review

Ernährung und Federpicken beim Geflügel – Eine Literaturstudie

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Invited Review Paper

Introduction

Feather pecking and cannibalism are generally considered to be caused by a complex of genetical and environmental factors. Among the environmental factors nutrition and feeding behaviour play a prominent role. Nutritionists and ethologists approach the problem of feather pecking in different ways. While nutritionists assume that feather pecking is caused by nutrient deficiencies or imbalances, ethologists search the primary causes of feather pecking in fundamental drives related to food intake. There are numerous studies which showed the influence of raw materials, crude protein or single nutrients, such as amino acids and minerals on feather pecking. The first nutritional experiments have been reported as of the 1950s. During the last years there was an increasing interest in the effect of fibre and feathers on feather pecking and feed-related behaviours. While most experiments have been carried out with layer-type chickens, the problem of cannibalism exists in meat-type chickens, turkeys and other domestic poultry species, such as quail, muscovy ducks and ostriches. This paper reviews the main publications on nutrition and behavioural aspects related to nutritional aspects and feeding behaviour in fowls.

The effect of feedstuffs

The main ingredients of poultry diets have been investigated with regard to their risk of stimulating damaging pecking behaviour.

Grain types

Oats seem to be the grain type that reduce feather pecking relative to barley and wheat (BEARSE et al., 1940; SCOTT et al., 1954a; SIEBEN, 1982; WAHLSTROM et al., 1998). In pheasants, known to be severe feather peckers in suboptimal conditions, it was possible to avoid cannibalism in two flocks of breeder birds by adding oats to the ration (PULLIAMEN, 1965). In chickens, the positive effect interacts with genotype. Some strains respond positively to oats, others do not (SIEBEN, 1982; WAHLSTROM et al., 1998). KARLSON (1996) found LSL to have better plumage on rations with high levels of oats while the Swedish breed, Svenskflan, a cross between White Leghorn and Rhode Island Red, maintained a high quality plumage regardless of oat content. Also suboptimal environmental conditions increase the positive effect of oats. For example the detrimental effects of potassium deficiency (WAHLSTROM et al., 1998) or restricted feeder space (SIEBEN, 1982) were less pronounced in flocks given supplements of oats.

Comparing barley and wheat, ABRAHAMSSON et al. (1996) found a better plumage condition in layers fed a diet high in barley (25% barley/39% wheat) compared to a diet high in wheat (50% wheat/14% barley).

Protein-rich feedstuffs

There is little information on the effect of protein-rich feedstuffs on feather pecking and cannibalism. Hydrolysed feather meal, fishmeal, bloodmeal and meat and bone meal have been excluded from poultry feed for various reasons, and soybean meal has become the main source of protein. The lack of protein of animal origin has been considered one of the causes of feather pecking and cannibalism. ATIEH and AAROE (1993, loc. cit. MCKEAGAN et al., 2001) offered laying hens in a cafeteria-system three protein sources, bloodmeal, fishmeal or soybean meal additional to their feed. The highest levels of cannibalism were observed in the choice feeding system with bloodmeal and soybean meal. SAVORY et al. (1999) fed bantam pullets either a vegetarian diet on the basis of soybean meal, or a diet based on animal protein (bloodmeal, fishmeal and hydrolysed feather meal) or semi-purified casein. There was no significant difference in feather scores at 3 and 6 weeks of age. There was a tendency of higher damages in the animal protein group. Similar results were reported by MCKEAGAN et al. (2001). Commercial brown layers were fed either plant or animal-based diets during rearing and laying. The main protein source of the animal protein diet was fishmeal and that of the plant protein diet soybean meal. The numbers of vigorous pecking and pulling were higher in the plant protein groups throughout the experiment. There was, however, no significant difference between the treatments for the pecking damage scores. In two experiments RICHTER and HARTUNG (2003) compared layer diets containing 4% of meat and bone meal and 4 different diets based on protein of plant origin. There was a tendency of higher mortality in some of the vegetarian diets, the differences, however were not significant. HADORN et al. (1998) found no difference in mortality of layers fed diets either based on meat and bone meal, fishmeal or on soybean meal. The plumage

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of layers fed 4% of meat and bone meal was better than that of hens fed a vegetarian diet and diets of other animal protein sources (PETER and WALL, 1988). VAN KRAVEN et al. (2010) fed 4 different types of processed pork meal to layers. There were no significant effects of the diets on feather damages at the end of the experiment, but two of the pork meal (meat and bone meals) delayed the development of feather pecking. There was more walking, ground pecking and less time spent food eating in these groups as compared to the other types of pork meal (meat meals). The higher level of walking and ground pecking in the meat and bone meals could be related to the lower intake of certain amino acids. However, the litter in the meat and bone meal groups contained less water than in the meat meal groups and this might have stimulated walking and ground pecking.

In summary, there exists effects of particular feedstuffs on feather pecking and pecking-related damages in poultry. With regard to the effect of different types of cereals it seems that grains which contain high amounts of fibre show a positive effect on feather pecking and cannibalism. The effect is, however highly variable and subject to interactions with genotype and various environmental influences.

Protein, amino acids and energy

Detrimental effects of low protein diets on feather pecking and cannibalism have been reported by SCHARIS et al. (1947). A basal corn/wheat diet low in protein (13.5%) and fibre (2.6%) produced feather pecking in chicks. GERMAN and KRICHERSNER (1978) fed broilers 3 levels of energy ranging from 2850, 3350 to 3650 kcal ME/kg and 3 levels of protein (19, 23 and 27%). Feather eating increased with increasing energy levels in the diet. Less feather eating was recorded when the protein level increased. Similar results have been found by DONALDSON et al. (1955) and LEONG et al. (1955). The effect of low protein levels in the diet was obviously compensated by the increased feed and protein intake in the low energy diet. Contrasting results have been reported by CAIN et al. (1984). The authors fed growing pheasants diets containing 16, 19 and 22% of crude protein. The lowest level of protein produced high damages through feather pecking. The situation could be improved by raising the energy level from 2530 to 2970 kcal ME/kg. AMBROSEN and PETERSON (1997) found an improvement in plumage condition of caged layers with increasing levels of protein from 11.1% to 19.3% in isocaloric diets. Regression analysis showed that the feather score on a scale from 5 (very poor) to 20 (very good) increased by 0.4 to 0.5 points for each percent increase in protein in the feed. The same picture was seen with respect to mortality due to cannibalism. The mortality caused by cannibalism increased from 5.1 to 8.3 and 17.6% when the protein level was lowered from 13.8 to 12.5 and 11.1% respectively. These authors also found a strain × protein level interaction in plumage condition of 4 Leghorn strains, but not in 3 strains of layers of medium body size.

CONNOR and PETERSON (1986) fed 8 to 20 weeks old pullets of two layer strains on a diet low in lysine (max. 0.4%) and arginine (max. 0.56%). This gave rise to more feather pecking in the laying period (15th laying month) in one strain, but not in another. A surplus of arginine was found to stop feather pecking and cannibalism in groups of chickens and pheasants (SIREN, 1963). When adding arginine to a basal diet holding 3.9% arginine of crude protein (normal) to 6.9%, cannibalistic pecking at first rose, then declined, and after 2 days stopped. This could not be verified by MADSEN (1966). He raised the same levels of arginine as suggested by SIREN, but found a high level of feather pecking but no consistent pattern in relation to treatment, in three experiments with pheasants and partridges. NEAL (1956) reported on 'pick-outs' in relation to methionine supplementation in two blocks of layers. The basal diet had a calculated content of 0.20% methionine. The experimental diet was supplemented to contain 1%. It was found that this indicate that methionine supplementation at a sufficient level can suppress cannibalism and pick-outs. CHEEK and DADDY (1957) (loc. cit. in MARSHAM and SIEVENS, 1962) failed to find any effect of methionine level on incidence of cannibalism. HUGHES and DUNCAN (1972) found higher pecking damage from 10 to 20 week old pullets of two Leghorn strains fed a growers' ration low in methionine. These authors also showed a strain × diet interaction for pecking damage from 6 to 18 weeks. One strain was pecked less on diet 1 and the other strain was pecked less on diet 2, when the diets differed in their methionine content. A diet × brooding temperature interaction was intermittently evident from weeks 6 to 17 in this study. Chicks fed a diet low in methionine and brooded at a 29°C temperature had less pecking damage than those brooded at 32°C. The opposite was true for birds fed a diet higher in methionine. High levels of cannibalism (20%) have been found in hens fed an organic diet containing 0.34% of methionine. The mortality, which was mainly caused by cannibalism, was reduced to 10.3% when the same diet was supplemented up to 0.41% of methionine (ANONYMOUS, 1997). KAER and SÖRENSSEN (2002) fed medium heavy free range hens diets containing 0.5% or 0.9% methionine + cystine. No feather pecking or cannibalism was recorded in any treatment. DANNER and BESSE (2000) fed white layer hybrids (SL) increasing levels of methionine (0.22, 0.26, 0.31 and 0.36%). There was a clear decrease in increasing methionine supplementation with reduced mortality and improved feather conditions. The main improvement could be observed when methionine level was raised from 0.22 to 0.26 which corresponded to a methionine + cystine level from 0.49 to 0.53.

Tryptophan is a precursor of serotonin, which acts as a neurotransmitter. The dietary level of tryptophan influence the level of serotonin in the brain (BERNSTROM, 1981), which in turn modulates aggressive behaviour in broiler breeder males (SIREN et al., 1990), fear (tonic immobility response) in broilers (NEWBERRY and BLAIR, 1993) as well as self pecking in parrots (FELGAR and RAM, 1993) and most likely feather pecking in laying hens (VAN HAMERUM et al., 2004; VAN HAMERUM et al., 2002). Less feather damage was observed in bantam chickens fed tryptophan levels considerably higher than recommended (22.6 versus 2.6 g/kg feed) (SABORY et al., 1999).

Minerals including trace elements

Inadequate supply in the diet has been reported to be a possible cause of cannibalism in poultry (COOK, 1992). Swineaux and PARSONS (1992) have alleviated outbreaks of cannibalism by the addition of sodium bicarbonate to drinking water at 2.5 g/l. HUGHS and WHITEHEAD (1974) did not find more feather pecking or pecking activity in caged layers fed a sodium deficient (0.03%) diet. This is explained by the fact that egg production ceased almost completely reducing the sodium requirement to a minimum. When adequate sodium levels were fed, egg production increased and plumage condition decreased, indicating that feather pecking increased. HUGHS and WOOD-GUSH (1973) deprived hens of calcium and found increasing general pecking activity, termed 'exploratory' behaviour, and locomotion. Feather pecking was not recorded. NESTLER et al. (1945) reported a range of observations concerning the control of cannibalism in Bobwhite quail using different
of layers fed 4% of meat and bone meal was better than that of hens fed a vegetarian diet and diets of other animal protein sources (Perdew and Wolters, 1988). Van Soest et al. (1991) fed 4 different types of processed pork meal to layers. There were no significant effects of the diets on feather damage at the end of the experiment, but two of the pork meals significantly reduced the development of feather pecking. There was more walking, ground pecking and dust bathing in groups as compared to the other types of pork meals. The higher level of walking and ground pecking in the meat and bone meal groups was seen in the presence of certain amino acids. However, the litter in the meat and bone meal groups contained less water than in the meat meal group, and this might have stimulated walking and ground pecking.

In summary, there exists effects of particular feedstuffs on feather damage, and different mechanisms in poultry. With regard to the effect of different types of cereals it seems that grains which contain high amounts of fibre show a protective effect against feather pecking and cannibalism. The effect is, however, highly variable and subject to interaction with genotypes and various environmental influences.

**Protein, amino acids and energy**

Deteriorative effects of low protein diets on feather pecking and cannibalism have been reported by Schurman et al. (1947). The lowest level of protein (15.3%) in the diet also produced feather damage and cannibalism as well as the lowest protein (2.6%) produced feather pecking in chicks. Chicks and Kuwatsuka (1978) fed broilers 3 levels of energy intake (1,250 KJ/MJ, 1,750 KJ/MJ and 3,000 KJ/MJ) and 12 levels of protein (19, 25 and 27%). Feather eating increased with increasing energy levels in the diet. Less feather eating was reported at 25%. Similar results have been found by Dormidont et al. (1995) and Liao et al. (1995). The effect of low protein levels in the diet was observed to have a significant increase in feather pecking and protein intake in the low energy diet. Contrasting results have been reported by Coon et al. (1984). The authors fed growing broilers diets containing 18, 19 and 22% of crude protein. The lowest level of protein produced high damages through feather pecking. Their results could be improved by feeding the energy level from 2590 to 2570 kcal/ME/kg. Amongson and Petersan (1997) found an improvement in cannibalism and feather pecking with increasing levels of protein from 11.1% to 19.3% in isocaloric diets. Regression analysis showed that the feather score on a scale from 5 (very poor) to 20 (very good) increased by 0.4 to 0.5 points for each percent increase in protein in the feed. The same picture was seen with respect to mortality due to cannibalism. The improvement in this caused this increase from 1.3 and 17.6% when the protein level was lowered from 13.8 to 12.5 and 11.1%, respectively. These authors also found a strain × protein level interaction in plumage condition of 4 Leghorn strains, but not in 3 strains of layers of medium body weight.

Conrad and Peterson (1984) fed 8 to 20 olds poults of two layers a strain on a diet low in lysine (max. 0.4%) and arginine (max. 0.56%). This gave rise to feather pecking and cannibalism in groups of increased size and severity (Shires, 1965). When adding arginine to a basic diet holding 3.9% arginine of crude protein (normal) to 9% arginine of crude protein, feathers were significantly increased (Shires, 1965). When adequate lysine levels were fed, egg production increased and feather pecking and cannibalism was significantly decreased (Shires, 1965). When adequate lysine levels were fed, egg production increased and feather pecking and cannibalism was significantly decreased (Shires, 1965). When adequate lysine levels were fed, egg production increased and feather pecking and cannibalism was significantly decreased (Shires, 1965). When adequate lysine levels were fed, egg production increased and feather pecking and cannibalism was significantly decreased (Shires, 1965). When adequate lysine levels were fed, egg production increased and feather pecking and cannibalism was significantly decreased (Shires, 1965). When adequate lysine levels were fed, egg production increased and feather pecking and cannibalism was significantly decreased (Shires, 1965). When adequate lysine levels were fed, egg production increased and feather pecking and cannibalism was significantly decreased (Shires, 1965). When adequate lysine levels were fed, egg production increased and feather pecking and cannibalism was significantly decreased (Shires, 1965).
The high feather pecking lines, whether selected for pecking of a bunch of feathers or for severe pecking at the feathers of pen mates differed significantly in the number of feathers eaten from a transparent sheet of plastic (Harlander-Mатаuscher et al., 2007a) and in an operant conditioning situation (Harlander-Mатаuscher et al., 2006b; Hauser, 2007). This confirms findings of McKergen and Savory (1999a) and McKergen et al. (2001) who reported that hens which had been identified as feather peelers are significantly more loose feathers than non-feather pecking hens. Similar results have been found by Ramadán and von Bonell (2008). They raised Lohmann Silver pullets from day-old to 16 weeks of age in one of two conditions. In one treatment the cast feathers were systematically removed from the floor, while in the control all feathers were left. There was no significant difference in the behaviour, including feather pecking, between the treatment and the control during rearing. But in the laying period the hens raised in the feather-removed conditions showed less severe feather pecking and a better plumage than the control.

Discussion and Conclusions

The level of metabolisable energy in the diet seems to have little direct effect on feather pecking and cannibalism. The level of metabolizable energy obviously acts through the regulation of feed intake and, thus, may increase or decrease the severity of the deficiency in particular nutrients. It is generally acknowledged that deficiency in crude protein, amino acids, and minerals are being detected by the birds within a short delay and elicit increased exploration behaviour. This behaviour can redirect their attention to the plumage of their pen mates, and thus, initiate feather pecking. Exploratory behaviour related to feeding or foraging in chickens is usually expressed by increased locomotor activity, ground scratching and ground pecking (Blokhus, 1986). Increased locomotor activity of chickens in response to nutritional deficiencies has been reported by Hughes and Wood-Gush (1973) for calcium deficiency and Besse (1978) for sodium deficiency in laying hens. Van Kruipen et al. (2011) found increased locomotor activity in pullets with a low intake of various amino acids. This confirms the general stimulating effect of nutritional deficiencies on activity.

According to own experience and unpublished reports severe feather pecking and cannibalism develop within a few days and affects a large number of birds when nutrient deficient diets are fed. It usually disappears rapidly after restoring adequate nutrient levels. Nevertheless, it is interesting that feather pecking has been found to be genetically linked to high locomotor activity (Kava, 2009). Further, birds found to be physically more active as pullets have a higher risk of developing feather pecking as adults (Navarro et al., 2007). How activity and feather pecking is exactly connected and influenced by one another physiologically is still to be elucidated.

Feather pecking, however, also occurs when the diet contains adequate levels of all nutrients and a surplus of certain specific nutrients does not reliably prevent it. In order to ensure the supply of nutrients most poultry diets are highly concentrated with regard to the level of energy and protein. In addition the volume of poultry feed is often reduced by pelleting and crumbling. This allows the ingestion of high amounts of feed within a short time. The short time required for feed intake is considered a major cause of behavioural problems in farm animals in general and in poultry in particular. Chickens and turkeys under natural conditions spend about 40 to 60% of the day with feed-related activities, searching and eating (Hughes and Black,
when fed as mash, but not when fed as pellets (Blaas et al., 1949).

Nystul (1945) fed Bobwhite quail (Colinus virginianus) 12% of atomized (11% fibre and 11% wood pulp) without any significant effect on the occurrence of cannibalistic pecking, primarily toe-pecking, and secondarily feather picking. In 1946, the energy density of the diet decreased and the fibre content at the same time increased. This increased the incidence of cannibalism in poults. The opposite, increasing fibre content by adding oats, was found to improve plumage condition and decrease cannibalization (Soret et al., 1954a).

Blaas et al. (1940) fed layer corn a based diet of low (39%) or high (11-12%) fibre by adding oats. Damages to the integument of the birds occurred especially near the water extract, oat hull ash or sodium silicate could not prevent pecking indicating that the diet did come from other sources.

Vos Kruusmaa et al. (2009) fed ISA Brown layers high or normal NSP levels (15.9 or 23.6%) with normal or low energy diets (2625 or 2430 kCal/me), respectively. There was no significant effect of NSP or the energy level on the final feather scores or on the ruling rate due to cannibalism. The development of feather deterioration, however, was delayed to some extent, when the NSP were offered in a coated granular form. Koman (1997) fed increasing levels of fibre to chickens. Feather score improved dramatically at the level of 8% of fibre and mortality due to cannibalism was also reduced significantly. From 18 weeks onwards all experimental groups were given a conventional low fibre layer diet. Feather pecking continued to increase in all groups until the end of the trial on the high-fibre diet maintaining the lower level. In the high-fibre diet, however, there was a sharp increase of feather pecking and an overall increase in the prevalence of cannibalism after the change to the low fibre diet.

When the hens of the same experiment were given a free choice between the high fibre, the high feather and control diets 22% of the layers preferred both diets against the control diet (Blaas et al. 2008). The hens of the high-fibre diet were raised on a control diet and low-fibre diets, but not by the hens raised on the high-feather diet. This shows a clear effect of early experi ence of the preference of fibre and feathers in the diet of the chicks. Hens of a Rhode Island Red line which have been divergently selected for high and low pecking to a bundle of feathers were also found to differ in their choices of low and high digestible materials. The high pecking hens showed a preference for pellets versus wood shavings (Blaas et al. 2007). Kaman and Bessell (2002) observed adult high and low feather pecking hens a high and low fibre diet in a cage and found that the fibre from the feather pecking line were significantly more of the high fibre diet as compared to hens from the low feather pecking line. The cause for this particular preference has not been elucidated so far.

Discussion and Conclusions

The level of metabolizable energy in the diet seems to have a little direct effect on feather pecking activity. The level of metabolizable energy obviously acts through the regulation of feed intake and, thus, may increase or decrease the energy intake by the birds with a high or low energy diet on a fixed level of fibre. Increasing the dietary fibre content at a fixed level of fibre and energy intake in young chickens is usually expressed by increased locomotor activity, ground scratching and ground pecking (Blaas et al., 1986). All these activities are known to have a negative impact on the high-feather diet maintaining the lower level. In the high-fibre diet, however, there was a sharp increase of feather pecking and an overall increase in the prevalence of cannibalism after the change to the low fibre diet.

According to own experience and unpublished reports red pullet diets used to be reduced in fibre for a short period of time to a few days and affects a large number of birds when nutrition deficient diets are fed. It usually disappears rapidly after correction of the nutrition deficiency. Nevertheless, it is interesting that feather pecking has been found to be genetically linked to high locomotor activity (Koman, 2009). Further, birds of the same age found to be good food and aggressive forage hens have a higher risk of developing feather pecking as adults (Nooderry et al., 2007). How activity and feather pecking is exactly connected and influenced is not yet understood. However, the phenomenon is known to be a significant factor in feather pecking.

Feather pecking, however, also occurs when the feed con tent is low in protein. The presence of the low-fibre pecking line to both diets was small and not significant. White Leghorn lines selected for high and low feather and control diets were found to differ in their choice of low digestible materials. The high feather pecking hens showed a preference for pellets versus wood shavings (Blaas et al., 2007). Kaman and Bessell (2002) observed adult high and low feather pecking hens a high and low fibre diet in a cage and found that the fibre from the feather pecking line were significantly more of the high fibre diet as compared to hens from the low feather pecking line. The cause for this particular preference has not been elucidated so far.

The high feather pecking lines, whether selected for pecking of a bunch of feathers or for severe pecking at the feathers of pen mates differed significantly in the number of feather pecking pecking hens from normal spontaneous pecking (Halmahli-Ketotieb et al., 2007a) and in an operant conditioning situation (Halmahli-Ketotieb et al., 2007b; Halmahli-Ketotieb et al., 2008a; Halmahli-Ketotieb et al., 2009a; and McKenna et al. 2009) who reported that hens from a high-feather diet had become, in general, significantly more coarse feathers than non-feather pecking hens. Similar results have been found by Breslin and van Borrel (1996) on a fixed level of fibre. These results may indicate that there is a difference in the behaviour, including feather pecking, between the treatment and the control during rearing. Treatments that might influence the initial preference but on the contrary, removing conditions showed less severe feather pecking and a better plumage than the control.

Conclusions

There is a consistent interrelationship of nutrition and feather pecking insofar as deficiencies in protein, amino acids and increased dietary energy levels have been shown for various species investigated. Supply of nutrients beyond the known requirements for production does not clearly reduce feather pecking. High fibre diets reduce the risk of feather pecking. The effect of dietary fibre on feather pecking can be attributed to its effect on the time spent feeding and on its influence on the passage time of the ingesta in the different parts of the intestinal tract. Though the risk of feather pecking is reduced the risk of reduced nutrient intake is prevented. Experiments with layer lines selected for high feather pecking have shown that these birds have a special sensitivity for low energy diets. This particular affinity to feathers is considered the cause of feather pecking under optimum feeding systems.

Summary

It has been shown in numerous experiments that nutrition influences feather pecking and cannibalism in different ways and under different conditions. Nutritional deficiencies are the main cause of the problems, ethologists consider feather pecking and cannibalism as a result of a fundamental drive related to feeding behavior. The present paper reviews the influence of nutrition on feather pecking and cannibalism with special aspects of dietary factors on the nutrition of chickens, the development of publications of the NSP in 60-70. The effect of nutritional deficiencies on protein and amino acids, mainly methionine and lysine, behaviors for feather pecking and cannibalism has been studied. The effect of dietary arginine on feather pecking is not clearly documented. The beneficial effect of tryptophane on feather pecking in different species has been attributed
to its function as precursor of serotonin. Sodium deficient diets increased feather pecking in many cases. The effect of other minerals and trace elements did not show consistent results. It is generally acknowledged that nutrient deficiencies increase the exploratory behaviour, which can be directed towards the feather cover of group mates. Supplementation of nutrients beyond the requirement was found to reduce feather pecking in the case of arginine only. A wide range of other feed ingredients and antibiotics have been tested with regard to their effect on feather pecking in chickens, quail and pheasants. None of the ingredients did prevent feather pecking.

There was a consistent trend of the feed structure with coarse particles, especially pellets and crumbles, producing more feather pecking and cannibalism than finely ground feed. This effect was explained by the influence of feed structure on the time spent feeding. Pelleted or coarsely ground feed reduce the time required to ingest the feed, and thus, may not allow to fulfill the drive of food pecking and exploration. The remaining pecking activity may be directed towards the pen mates’ feathers. The dilution of the range with crude fibre, especially with finely ground fibre, reduces feather pecking and pecking-related feather damages in pellets, laying hens and pheasants. The positive effect of dietary fibre on feather pecking can similarly to the fine feed structure – be attributed to the increase of time spent feeding. A part of the effect of dietary fibre is supposed to be caused by its influence on the passage of the ingesta through the gut. Although adequate levels of all nutrients and high fibre diets fed as fine mash reduce the risk of feather pecking it does not prevent it entirely. Feeding experiments with a chicken line selected for high feather pecking behaviour have shown that these birds show a special preference for feathers. They constantly eat feathers when offered on a sheet of plastic. Raw feathers in the diet show a similar effect on the passage of the digesta through the gut as indigestible fibre. However, the birds of the high feather pecking line prefer feathers over fibre when given the free choice. The cause for this specific preference for feathers remains to be investigated.

Key words

Laying hen, feather pecking, cannibalism, nutrition

Zusammenfassung

Ernährung und Federpicken beim Geflügel


Mit Rationen, die ausreichend mit Nährstoffen ausgestattet sind, eine feine Struktur haben und einen hohen Rohfasergehalt aufweisen kann die Ausprägung von Federpicken verringert aber nicht verhindert werden. Futterexperimente mit Hühnerlinien, die auf hohes Federpickenverhalten selektiert worden waren, haben gezeigt, dass diese Tiere eine ausgeprägte Prädilekten für Federn haben und Federn fressen, wenn diese ihnen auf Plastikdeckeln angeboten werden. Rohe Federn beeinflussen die Darmpassage in ähnlicher Weise wie Rohfasern. Die auf hohes Federpicken selektierten Tiere zeigten jedoch eine Prädilekten für Federn gegenüber Rohfasern. Die Ursachen dieser speziellen Prädilektionen sind nicht bekannt.

Stichworte

Legehenne, Federpicken, Kannibalismus, Ernährung

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