



Development of the fourth primary wing feathers in three types of duck

S. Szász, F. Bogenfürst, M. Varju

Pannon University, Faculty of Animal Science, Kaposvár, H-7400 Guba S. u. 40. Hungary

ABSTRACT

This study examined the development of the 4th primary wing feathers in three types of duck of greatly different genotype: the Pekin, the mule and the muscovy duck, in the first 12 weeks of life of the birds. The end-products of 200 Pekin type ducks, 200 muscovy ducks and 200 mule ducks originating from the Palotási Kacsafarm Kft. (Hungary) were the subject of the investigations carried out in this study. The ducks were raised separated according to sex. Each duck was fitted with a wing band, to enable the individual parameters to be monitored. The ducks were accommodated in 6 pens, separated according to genotype and sex. The ground area of the pens was 14 m². The initial stock density of birds per m² was gradually reduced to a level of 2.8 birds per m². Lighting was provided for a period of 23 hours per day in the first week, 18 hours per day in the second week and 12 hours per day from the third week. The initial lighting intensity was 18-20 Lux, being reduced gradually to 6-7 Lux. This was important, particularly due to the violent temperament of the muscovy ducks. The ducks were fed ad libitum. On the basis of the results obtained it was established that plumage growth both began and reached completion in the Pekin type first. By the 9th-10th week of life these birds had also reached slaughter maturity with respect to plumage development. The muscovy stock was the last to begin feather growth. Subsequent processing of the birds, mature for slaughter with respect to live weight, was hampered by the presence of feather sheaths. The mule ducks produced values between those observed in the Pekin type and in the Muscovy ducks for the parameters examined, but these had also failed to reach slaughter maturity as defined on the basis of plumage by the end of the experimental period. For the purposes of ensuring economically efficient processing of waterfowl, the requirement in the practical field is for ducks with rapid feather development; thus, the authors judge the developmental breeding of the faster fledging lines of the mule and the muscovy duck to be of great importance in breeding activity.

(Keywords: ducks, plumage, feather development)

ZUSAMMENFASSUNG

Entwicklung der 4. Handschwinge bei drei Ententypen

Szász, F. Bogenfürst, M. Varju

Pannon Universität, Fakultät für Tierproduktion, Kaposvár, H-7400 Guba S. u. 40. Ungarn

In der Untersuchung wurde die Federentwicklung an der 4. Handschwinge bei den Genotypen Pekingente, Flugente und Mulard festgestellt. Die Tiere wurden 24 Wochen

lang unter kommerziellen Entenmastbedingungen gehalten und nach Geschlechtern getrennt aufgezogen, 100 Tiere pro Genotyp und Geschlecht. Nach dem Einsetzen des Federwachstums wurde bei allen Enten jede Woche der linke Flügel gemessen. Bei den Erpeln der drei Genotypen begann zwar die Entwicklung der Handschwinge zu verschiedenen Zeitpunkten, aber die Wachstumsintensität war bei allen gleich. Die Barbari-Erpel zeigten von allen das langsamste Wachstum. Nach einer Woche trat bei den untersuchten Genotypen eine intensive Wachstumsphase der Federn ein, die bei der Pekingente bis zur 9., bei den Mularden bis zur 11. Lebenswoche andauerte, und bei den Barbari-Enten war sogar noch am Versuchsende ein kräftiges Wachstum festzustellen. Bei den weiblichen Tieren begann die Federentwicklung zuerst bei der Pekingente und erst nach zwei Wochen folgten die Barbari und Mularden. Nach einer 1-2 Wochen dauernden, anfangs weniger intensiven Phase konnte bei allen drei Genotypen eine kräftige Federentwicklung festgestellt werden, die bei den Pekingenten bis zur 9. Woche andauerte. Bei den Mularden und Barbari war das Federwachstum sogar noch in der 12. Versuchswoche intensiv.

(Schlüsselwörter: Enten, Befiederung, Federentwicklung)

INTRODUCTION

The significance of this topic can be appreciated from the fact that it is probable the rôle of duck meat products on the Hungarian market is to change considerably in the years to come, i.e. products with a low fat content and higher meat quality seem set to become predominant.

The following types were examined:

- the Pekin type, a domestic duck;
- the muscovy duck;
- the hybrid of these, the mule duck.

Each of the three genotypes examined represents a product in its own right on the market. Only the domestic duck is marketed as a roasting duck in Hungary; muscovy ducks and mule ducks are used exclusively for the production of duck liver by means of cramming.

MATERIALS AND METHODS

The end-products of 200 Pekin type ducks, 200 muscovy ducks and 200 mule ducks originating from the Palotási Kacsafarm Kft. (Hungary) were the subject of the investigations carried out in this study.

The ducks were raised separated according to sex. Each duck was fitted with a wing band, to enable the individual parameters to be monitored.

The ducks were accommodated in 6 pens, separated according to genotype and sex. The ground area of the pens was 14 m². The initial stock density of birds per m² was gradually reduced to a level of 2.8 birds per m². Lighting was provided for a period of 23 hours per day in the first week, 18 hours per day in the second week and 12 hours per day from the third week. The initial lighting intensity was 18-20 Lux, being reduced gradually to 6-7 Lux. This was important, particularly due to the violent temperament of the muscovy ducks. The ducks were fed ad libitum, and the feed composition for each genotype is given in *Table 1*.

Table 1**Duck diets**

Weeks of life(1)	Composition (2)	Pekin	Muscovy	Mule
1-2	crude protein (3) ME(4)	English duck starter feed (5) 20% 12.37 MJ/kg	Muscovy starter feed(6) 18.9% 12.47 MJ/kg	Muscovy starter feed(6) 18.9% 12.47 MJ/kg
3-24	crude protein(3) ME(4)	English duck rearing feed (7) 18.5% 13.0 MJ/kg		

1. Tabelle: Fütterung

Lebenswoche(1), Inhaltsstoffe(2), Rohprotein(3), Umsetzbare Energie(4), Starterfutter für Peking Enten(5), Starterfutter für Flugenten(6), Mastfutter für Peking Enten(7)

Measurements were taken on 56 ducks of each of the three genotypes (28 males and 28 females, the same individual birds being used each time). In the course of the experimental period the following were examined: changes in feather length on the abdomen, back, and length of primary feathers.

The length of the feathers was measured by means of a purpose-adapted ruler, in such a way that the ruler was placed close behind the feather to be measured, perpendicular to the body surface, after which the length of the part of the feather protruding from the skin was read off.

Feathers to be measured were in each case chosen so as to give a fair representation of the given area of feather growth. Digital scales were used for the purpose of recording live weight.

The measurements were, for the most part, taken by the same person. However, the measurement data obtained were nevertheless distorted slightly by deviations in the length of the feathers of the various regions of the body and the individual areas of feather growth.

On each occasion, the recording of feather length was accompanied by subjective observations. These were focussed chiefly on monitoring the various phases of feather development and the degree of feather cover attained, and on establishing the degree and nature of damage occurring in the feathers.

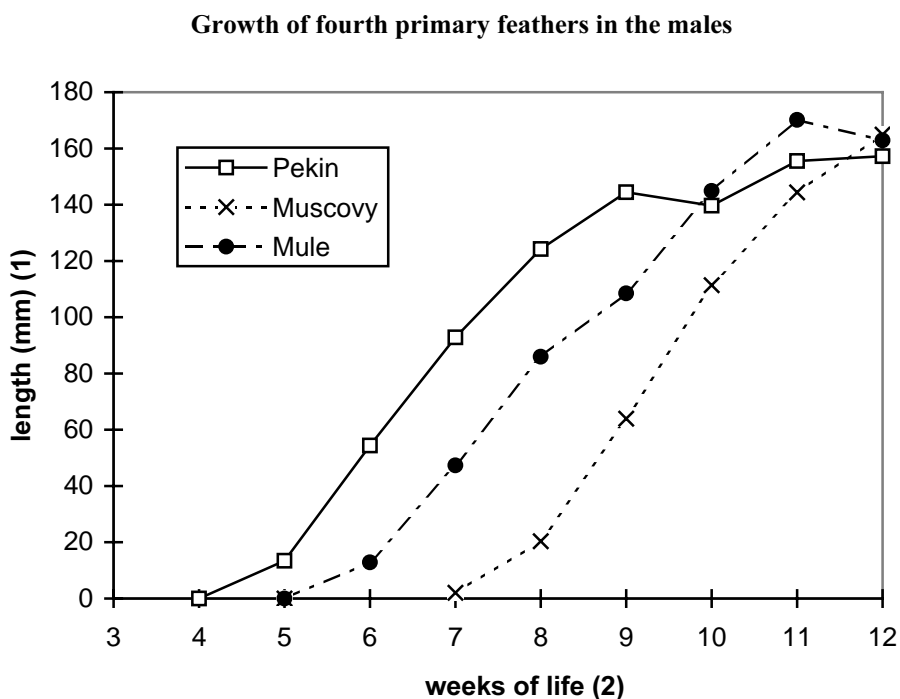
RESULTS AND DISCUSSION

Very great significance is often attributed to examinations connected with the state of development and the increase in length of the fourth primary feathers; the reason for this is that the growth of these feathers is linked to the level of development of the plumage as a whole and to increase in body weight. On examination of the above parameters, *Löhle* (1967), working with hens, and *Gehre* (1975), with geese, ascertained significant correlations in this respect.

In this experiment the development of the fourth primary feathers in Pekin, mule and Muscovy ducks was studied. The main objective was to detect differences among the three genotypes and between the sexes.

On the basis of the data obtained in the course of the study it was established that by the 4th week of life neither the Pekin, nor the mule, nor the Muscovy males had produced feathers of measurable length, i.e. the growth of the wing flight feathers had not begun by that point (*Figure 1*).

Figure 1



1. Abbildung: Entwicklung der 4. Handschwinge bei Erpeln

Länge (mm)(1), Lebenswoche(2)

Feather growth was observed to commence first in the Pekin males. In the 5th week of life it was possible to record data on feather length for approximately 85% of the genotype group; the remaining 15% and every individual in the mule and Muscovy groups showed no fourth primary feathers of such a length as to be measurable.

By the 6th week of life feather growth had also begun in 81% of the mule males; however, a wide range of deviation between the data recorded was ascertained (feather lengths of between 7 and 40 mm having been recorded).

By that point, 100% of the Pekin genotype group had measurable fourth primary feathers. The level of development of these developed in a similar manner in every

individual bird, this being corroborated by the very slight degree of divergence between the values recorded.

The Muscovy ducks were the last to begin fourth primary development. In this study only a few individual Muscovy ducks had primary feathers of measurable length by the 7th week of life.

Feather development in the Muscovy ducks only began substantially in the 8th week of life; at that point a period of intensive growth commenced and was still evident at the end of the study period. However, the Muscovy ducks were so far behind the other genotypes that even this intensive development only enabled them to catch up with the Pekin and the mule males by the 12th week of life.

In the 7th week of life the 4th primary vexilla on the mule males were half open, those on the Pekin males already totally open. In the 9th week of life the Pekin males began to approach the mean 120 mm feather length characteristic of fully developed feathers, while the mule males showed intensive development in feather growth up to the 11th week of life.

In the 10th week a reduction in feather length was observed in the Pekin males. In 40-50% of these drakes this was due to the abrasive effect of the various furnishings of the boxes. As the wing flight feathers approached maturity the birds tended to try out their wings, in consequence of which the wing feathers gradually became increasingly worn and damaged after collision with the feeders, the cage grating, etc.

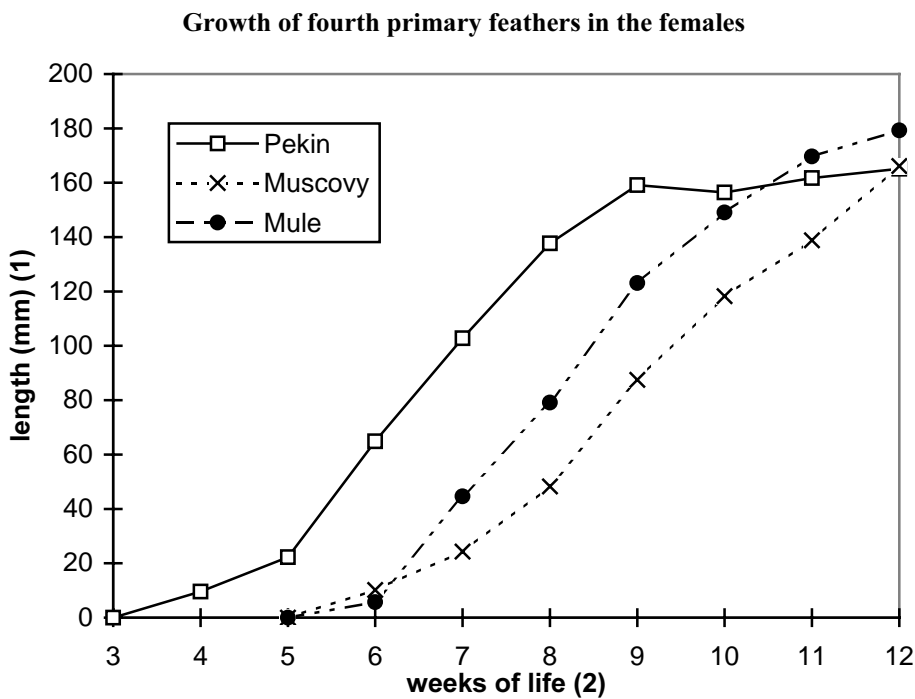
By the 11th week of life the vexilla of the wing flight feathers on the males of all three genotypes were open. In the case of the Pekin and the mule males the fourth primary feathers had reached the size characteristic of fully developed feathers by this point. This length was, on average, 157 mm in the Pekin males and 161 mm in the mule males.

In summary it can be established that feather development began at different points in time, but proceeded at approximately the same pace in the three genotypes. The greatest lag in feather growth was observed in the Muscovy males. In the genotypes examined the first week of feather growth was followed by a period of more intensive feather development, this period lasting until the 9th week of life in the Pekin males and until the 11th week in the mule males. However, vigorous feather growth was observed in the Muscovy males even at the end of the study period.

On examination of the females, (*Figure 2*) development of the fourth primary feathers was also observed to begin first in the Pekin genotype: this took place in the 3rd week of life, approximately one week earlier than in the Pekin males. By the 4th week of life the primary feathers of 77% of the Pekin females had already developed sufficiently for it to be possible to measure their length. In the 5th week of life, alongside both sexes of mule ducks, fourth primary feather growth was also observed to have begun in the Muscovy females: two weeks earlier than in the Muscovy males.

By that point in time the primary feathers were already of measurable size in every individual of the Pekin female group; the mean length of these feathers was found to be around 23 mm. By the 6th week of life the level of feather development in the Pekin females was seen to exceed substantially that of the females of the other genotypes. This was also verified by the fact that while in the majority of the Pekin females the vexilla of the fourth primary feathers were already half open, the mule females showed still undeveloped primary pin feathers, which on many birds were badly damaged, and in the Muscovy females these feathers were still in the early stages of development.

Figure 2



2. Abbildung: Entwicklung der 4. Handschwinge bei Enten

Länge (mm)(1), Lebenswoche(2)

By the 7th week of life the Pekin females had fully open feather vexilla; on the other hand, in the mule females only some individuals showed fourth primary feathers beginning to unfold; however, in the majority of these birds the wing flight feathers were found still to be undeveloped pin feathers, and also damaged. In the 7th week of life the least developed wing flight feathers of all were those of the Muscovy females. In addition to this shortfall in feather development a high degree of divergence was also observed between individual birds with respect to increase in feather length. (This genotype group included birds with wing flight feathers 5 mm and 50 mm long.)

Alongside the heterogeneity in feather length observed, the majority of the Muscovy females showed badly damaged wing flight feathers; this was caused by abrasion by the furnishings of the boxes and by feather pecking. The latter was presumably related to the temperament of the Muscovy duck (through boredom, lack of fibre, etc.).

By the 8th week of life the mean feather length in the Pekin females, 138 mm, began to approach that of full-grown primary feathers. On the other hand, the primaries of the mule females were still undergoing vigorous development at this point, showing a mean length of 83 mm. By the 8th week of life the deviations in feather length between individual Muscovy females had increased still further, as demonstrated by the fact that

in these females the feather lengths recorded ranged from 46 to 109 mm. In addition to heterogeneity, damage to the primaries was also found to be characteristic of the Muscovy genotype group. By the 9th week of life a highly homogeneous genotype group had developed with respect to the fourth primaries among the Pekin females. With a mean primary feather length of 159 mm these females then approached fully developed primary length. Subsequent to this point only slight changes in feather length were observed in the Pekin females. At the same time, the mule and the Muscovy females, lagging behind the Pekin genotype, continued to show strong feather growth even in the 12th week of life.

Thus, to summarise it can be established that the Pekin females were the first to begin fourth primary feather development, this commencing only two weeks later in the Muscovy and the mule females. Following the less intensive initial period of 1 to 2 weeks, vigorous feather development was observed in all three genotypes, this being maintained up to the 9th week of life in the Pekin females. On the other hand, feather growth in the mule and Muscovy females still proved intensive in the 12th week of the study.

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Corresponding author (*Adresse*):

Sándor Szász

Pannon University, Faculty of Animal Science
H-7400 Kaposvár, Guba S. u. 40. Hungary
Pannon Universität, Fakultät für Tierproduktion
H-7400 Kaposvár, Guba S. u. 40. Ungarn
Tel.: 36-82-314-155, Fax: 36-82-320-172
e-mail:szaszs@atk.kaposvar.pate.hu