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## Feeding behavior of three breeding duck genetic types during growth

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**07-11 AUGUST 2022**  
PARIS, FRANCE | PALAIS DES CONGRÈS



# Feeding behavior of three breeding duck genetic types during growth

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# Context



Feed intake = important economic factor (Litt et al., 2013)  
Individual cages not welfare friendly  
Emerging scientific needs



Development of a single-place electronic feeder (SEF) by INRAe (Basso et al., 2014)



AIM: To describe the longitudinal growth and feeding traits in the three genetic types of ducks farmed for fatty liver production in France

## 2 PARENTAL BREEDS

♂ Muscovy duck  
(*Cairina Moschata*)

♀ Pekin duck  
(*Anas platyrhynchos*)

## 1 STERILE HYBRID

Mule duck

♂ Mule duck = 95% of fatty liver production  
in France

Muscovy duck



Pekin duck



Mule duck



## IN OUR STUDY

Fairly old INRAe  
experimental lines

Commercial line

# Animals



## Muscovy duck

n = 41 males  
20 ducks/SEF



## Pekin duck

n = 35 males  
25 ducks/SEF



## Mule duck

n = 40 males  
20 ducks/SEF

2 weeks of adaptation

5 weeks of measurement

*Non-contemporary animals but same rearing and housing conditions*

Hatching

# Device and Trait Records



## What are the types of visit?

### Single-bird visits

→ retained if feed intake  $> 2g$

### Visits without identification

### Multiple-bird visits

→ discarded from the final dataset

## What traits are available?

**Growth**

**Feed intake**

**Feeding behavior**



At several time scales:  
visit, hour, day, week,  
entire trial

Growth and feeding behavior estimated using 2 linear mixed models (MIXED procedure)

At the day

$$\mathbf{trait}_{ijk} = \mu + \mathbf{day}_i + \mathbf{line}_j + \mathbf{day}_i \times \mathbf{line}_j + \mathbf{a}_k + \varepsilon_{ijk}$$

$\mathbf{day}_i$	21 levels (from 28 to 49 d)
$\mathbf{line}_j$	3 levels (Muscovy, Pekin, and mule ducks)
$\mathbf{a}_k$	Animal repeated throughout time (random)
$\varepsilon_{ijk}$	Residual (random)

For the entire trial

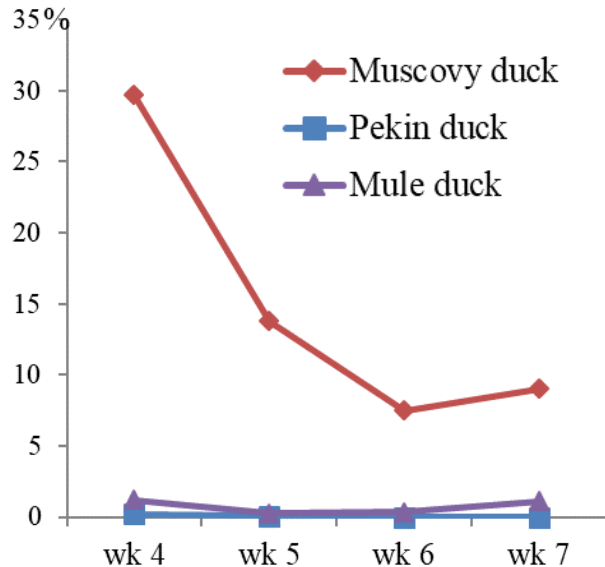
$$\mathbf{trait}_{jk} = \mu + \mathbf{line}_j + \varepsilon_{jk}$$

$\mathbf{line}_j$	3 levels (Muscovy, Pekin, and mule ducks)
$\varepsilon_{jk}$	Residual (random) with k the animal



# Type of Visits

Percentage of feed intake during multiple-bird visits per week



→ Muscovy ducks:

In wk 4, > 25 %

Then, decrease without disappearing completely

→ Pekin and mule ducks: stable and limited



Because of multiple-bird visits:

→ Week 4 data discarded

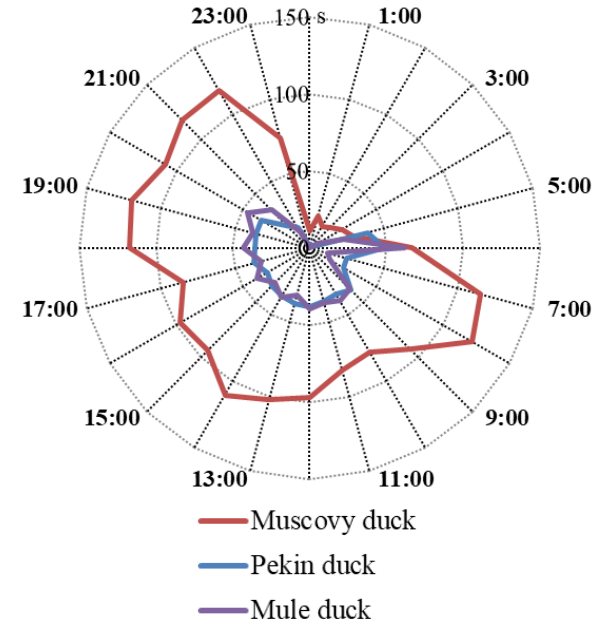
→ Individual feed intake +/- underestimated

# A Typical Day at the SEF during Growth



- Per hour  $\rightarrow \approx + 54$  s for Muscovy ducks in SEF

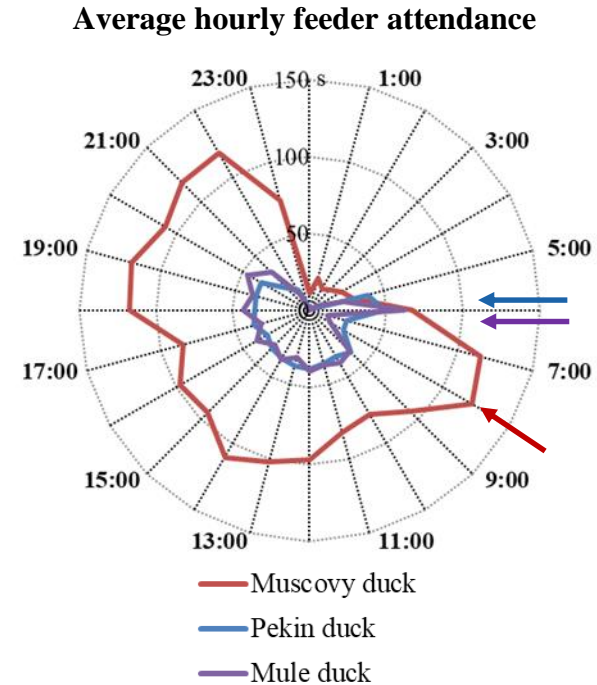
Average hourly feeder attendance



# A Typical Day at the SEF during Growth



- Per hour  $\rightarrow \approx + 54$  s for Muscovy ducks in SEF
- At 8:00  $\rightarrow$  peak of use for Muscovy ducks  
At 6:00  $\rightarrow$  peak of use for Pekin and mule ducks  
During the 2 h after the peak  $\rightarrow$  activity reduced  
Then throughout the day  $\rightarrow$  feeder attendance stable

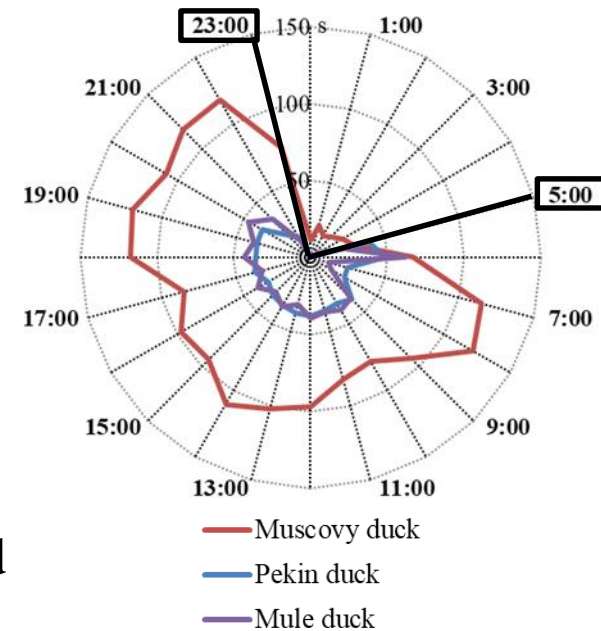


# A Typical Day at the SEF during Growth



- Per hour  $\rightarrow \approx + 54$  s for Muscovy ducks in SEF
- At 8:00  $\rightarrow$  peak of use for Muscovy ducks  
At 6:00  $\rightarrow$  peak of use for Pekin and mule ducks  
During the 2 h after the peak  $\rightarrow$  activity reduced  
Then throughout the day  $\rightarrow$  feeder attendance stable
- Between 5:00 and 23:00  $\rightarrow$  more than 91% of the SEF attendance for the three genetic types
- During night,
  - For Muscovy and Pekin ducks  $\rightarrow$  feeders little used
  - For mule ducks  $\rightarrow$  feeders did not use

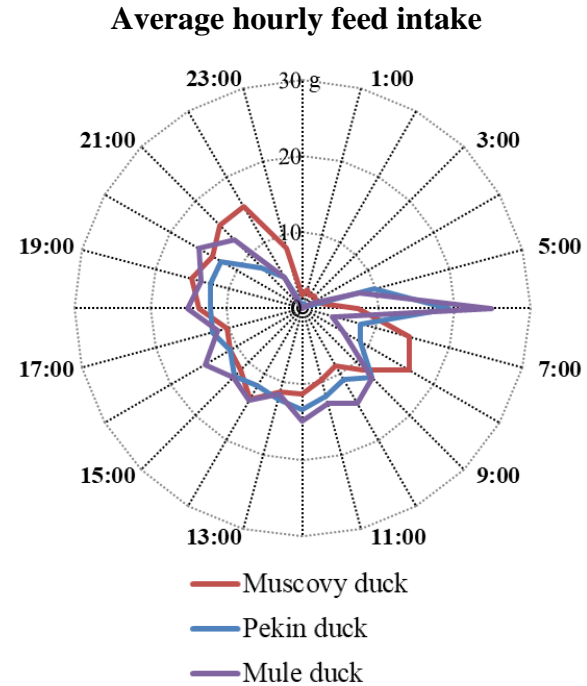
Average hourly feeder attendance



# A Typical Day at the SEF during Growth



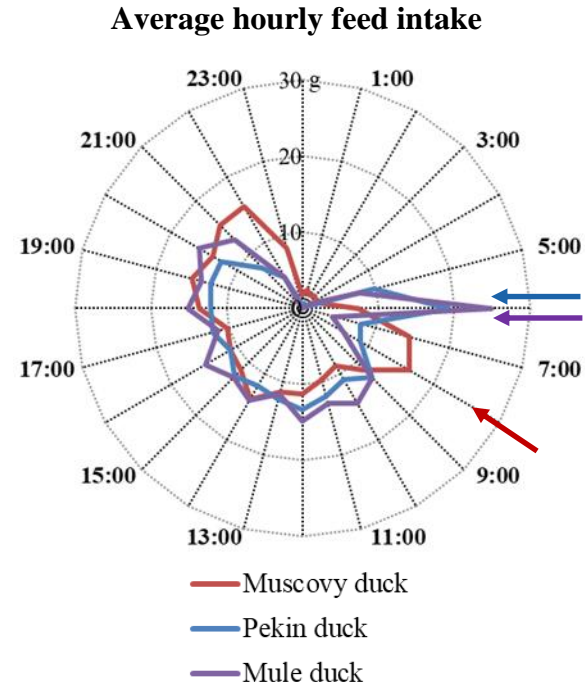
- Per hour → no difference in feed intake between genetic types



# A Typical Day at the SEF during Growth



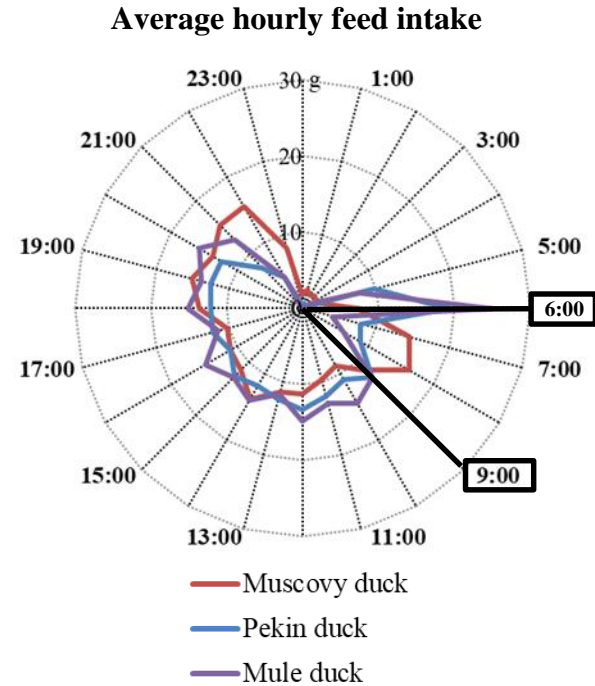
- Per hour → no difference in feed intake between genetic types
- At 8:00 → feeding peak for Muscovy ducks
- At 6:00 → feeding peak for Pekin and mule ducks



# A Typical Day at the SEF during Growth



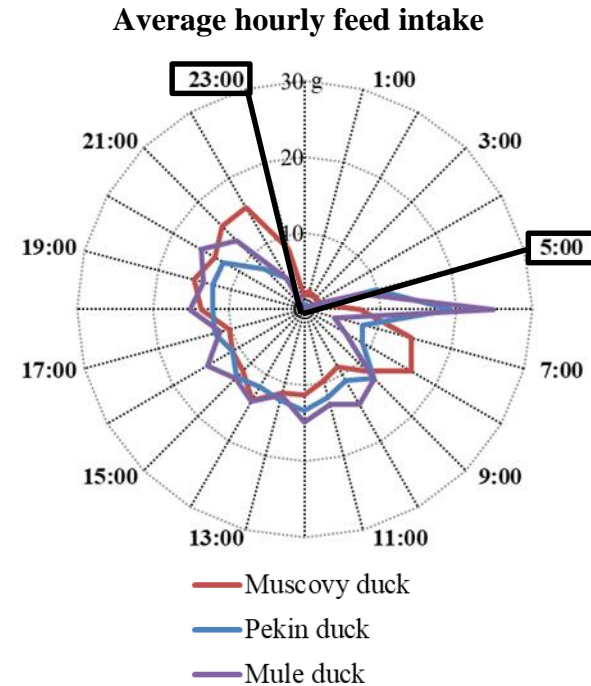
- Per hour → no difference in feed intake between genetic types
- At 8:00 → feeding peak for Muscovy ducks  
At 6:00 → feeding peak for Pekin and mule ducks
- Between 6:00 and 9:00 → more than 20% of the daily ration eaten per animal of each genetic type
- After 9:00 → feed intake stable



# A Typical Day at the SEF during Growth

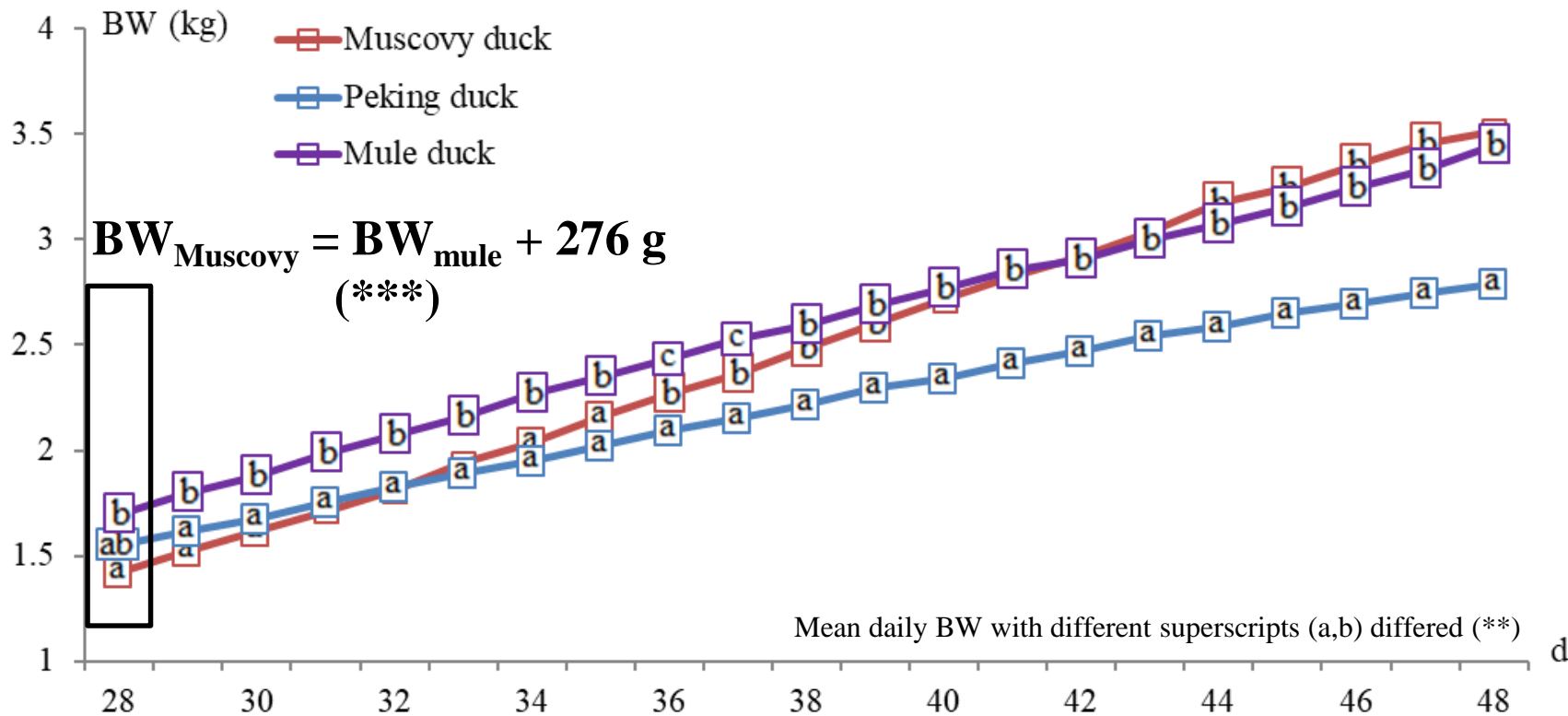


- Per hour → no difference in feed intake between genetic types
- At 8:00 → feeding peak for Muscovy ducks  
At 6:00 → feeding peak for Pekin and mule ducks
- Between 6:00 and 9:00 → more than 20% of the daily ration eaten per animal of each genetic type
- After 9:00 → feed intake stable
- During night,  
For Muscovy and Pekin ducks → little feed intake  
For mule ducks → no feed intake

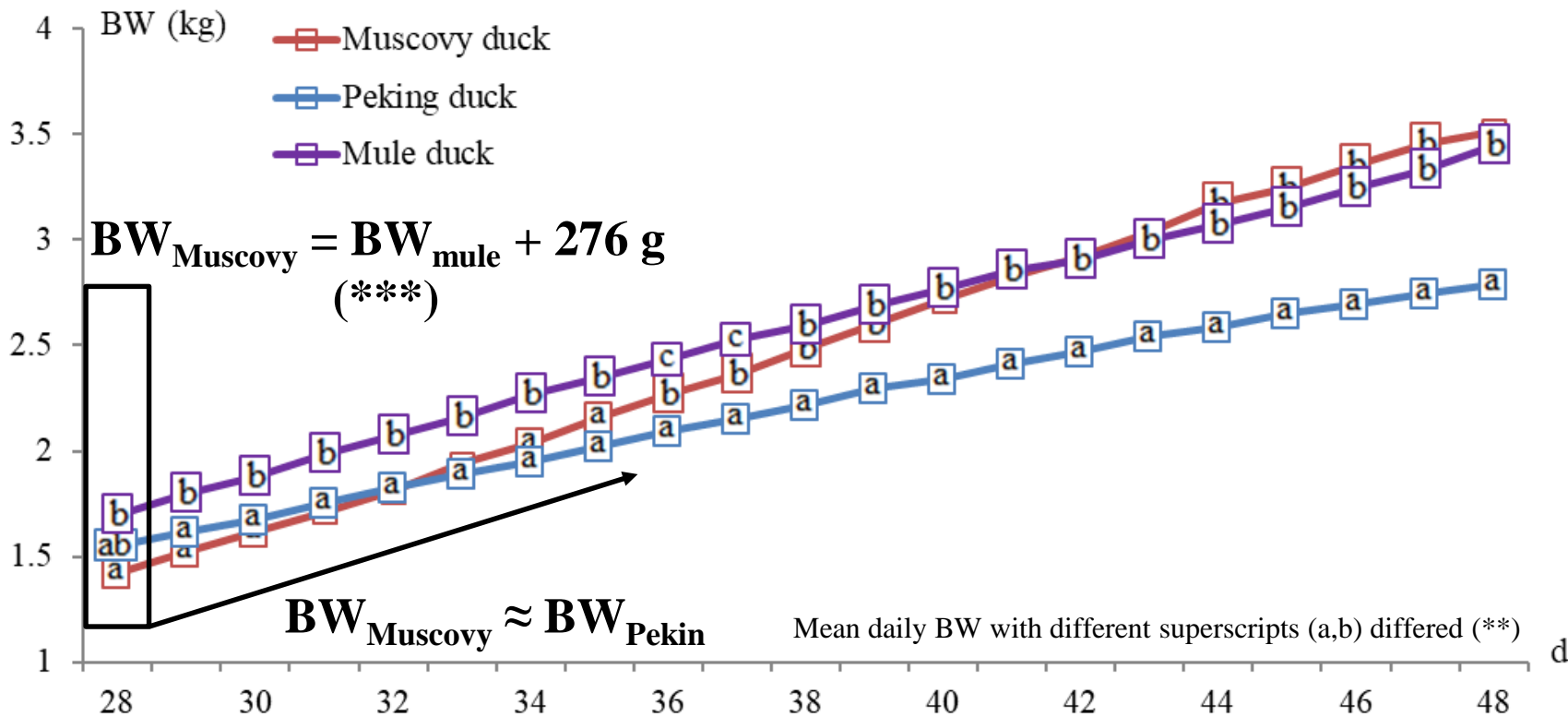




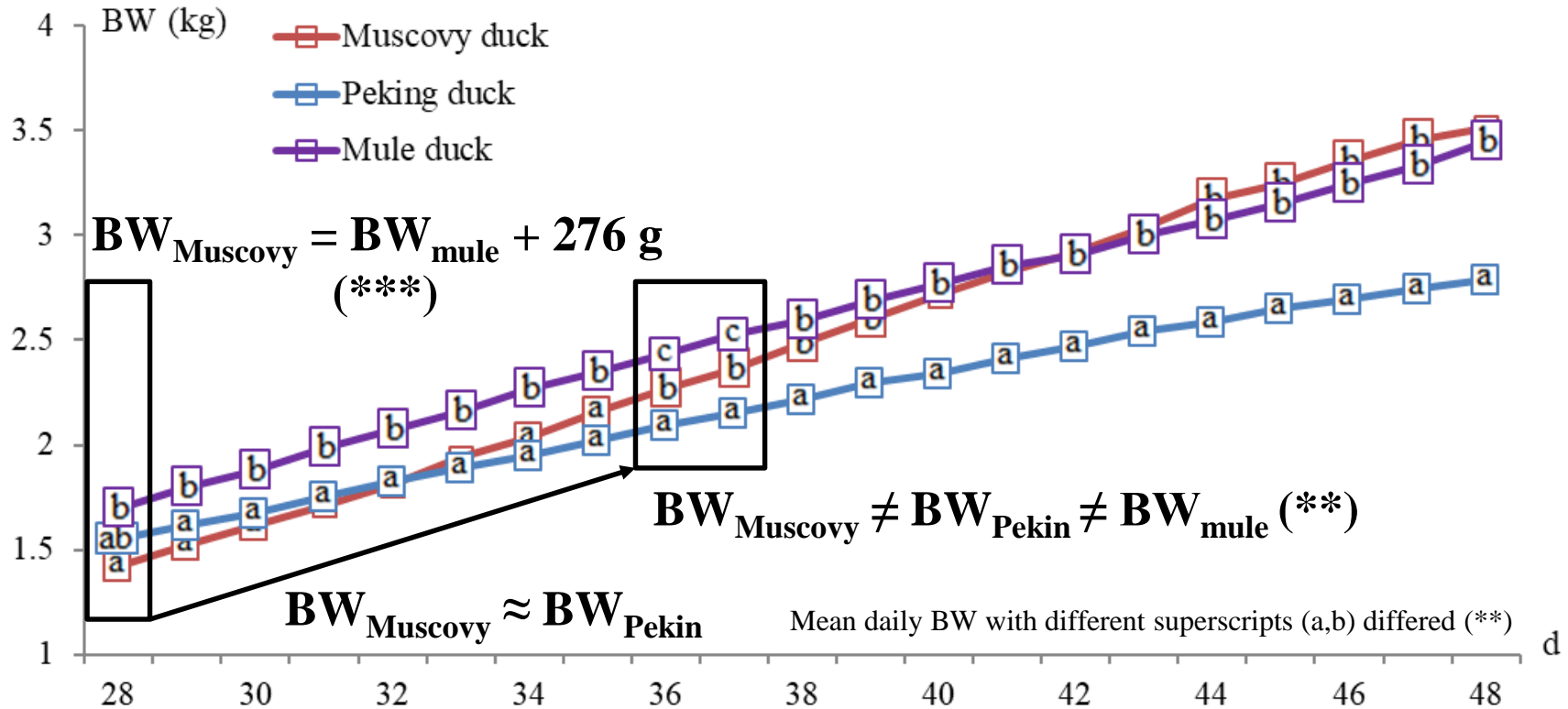
# Growth Characteristics from d 28 to 49



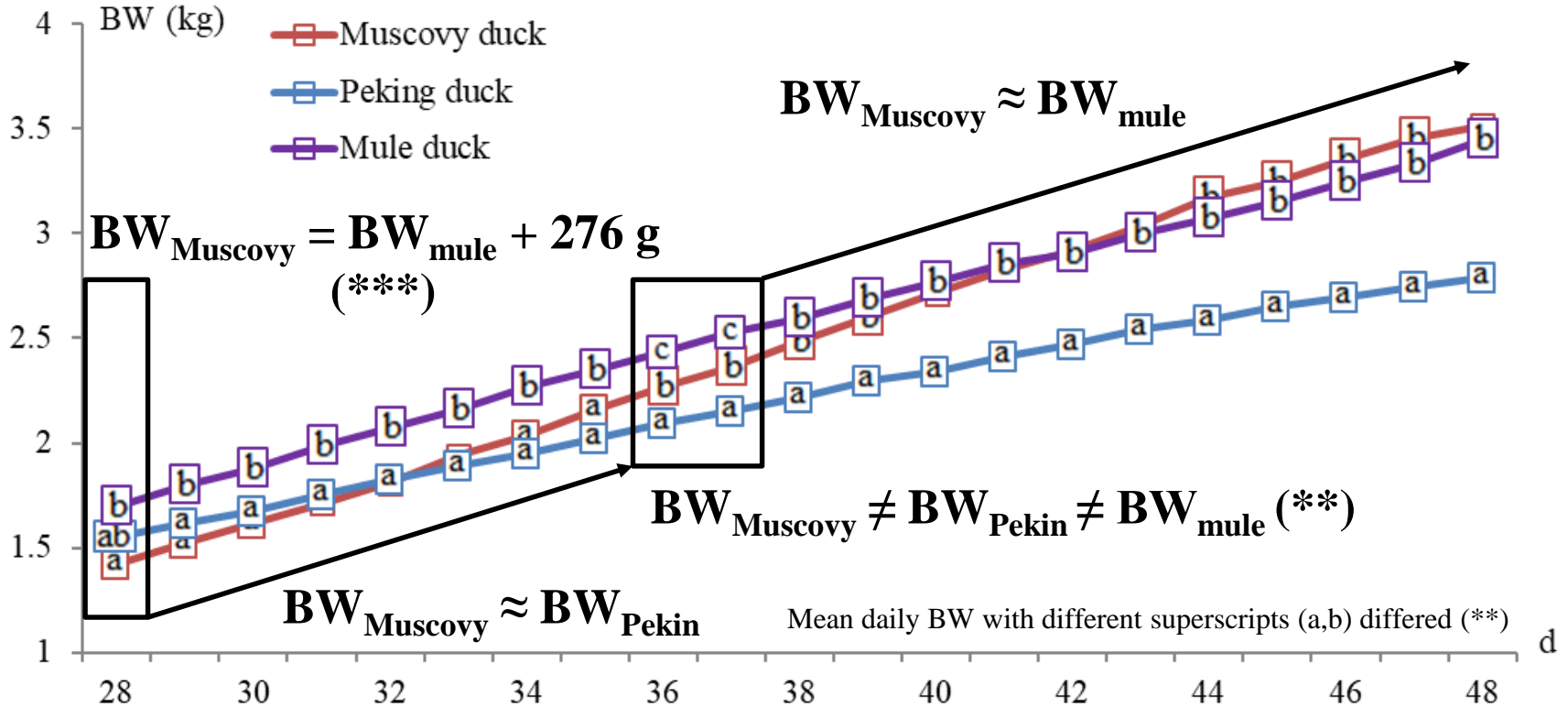
# Growth Characteristics from d 28 to 49



# Growth Characteristics from d 28 to 49

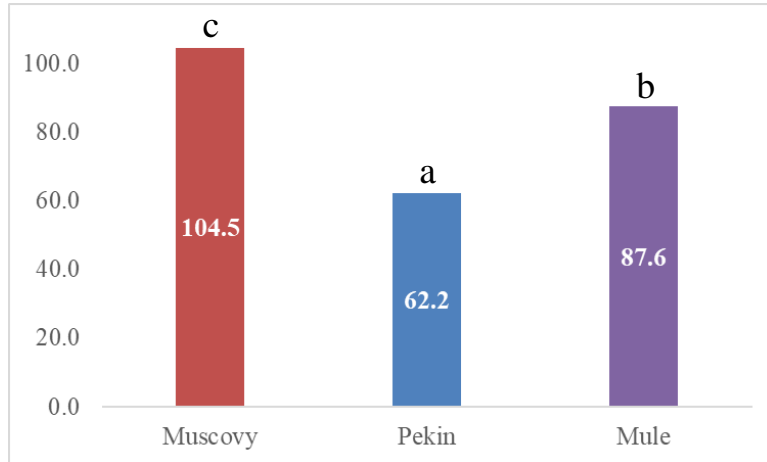


# Growth Characteristics from d 28 to 49



# Growth and Feeding Behavior During the Test

Average daily gain (g/d)

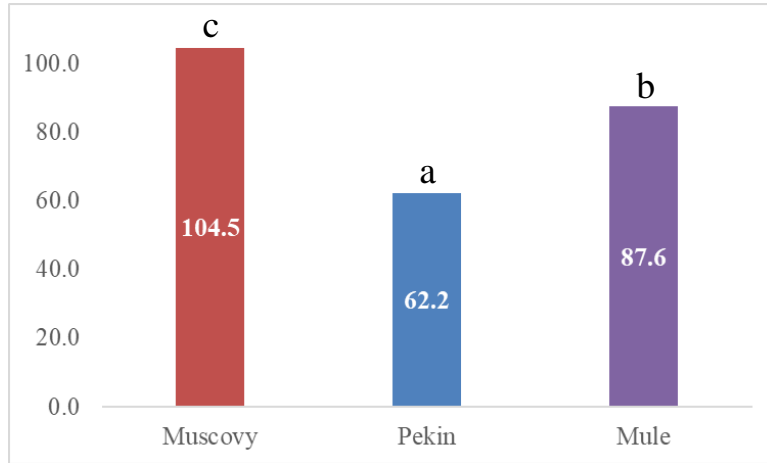


Muscovy  $\neq$  Pekin  $\neq$  Mule (\*\*\*)

# Growth and Feeding Behavior During the Test

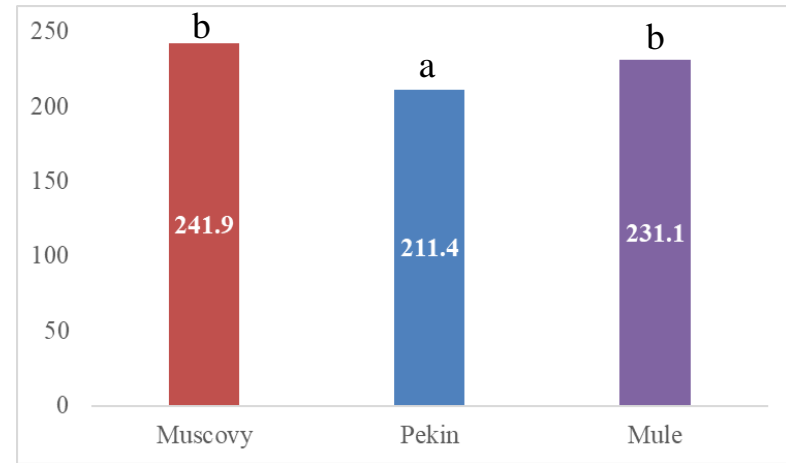


**Average daily gain (g/d)**



Muscovy  $\neq$  Pekin  $\neq$  Mule (\*\*\*)

**Daily feed intake (g/d)**

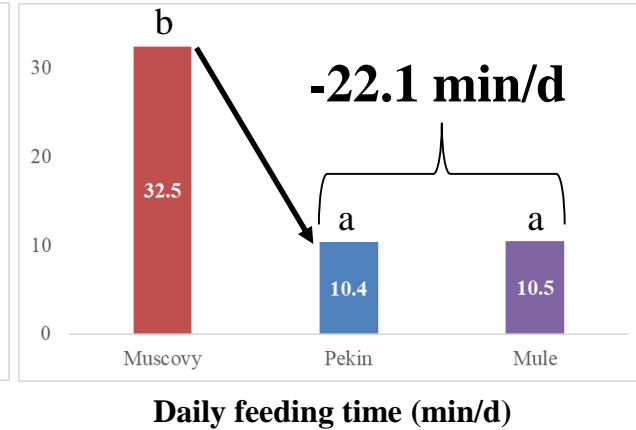
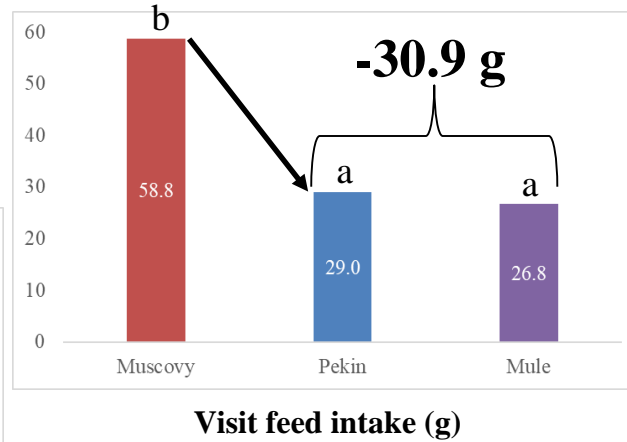
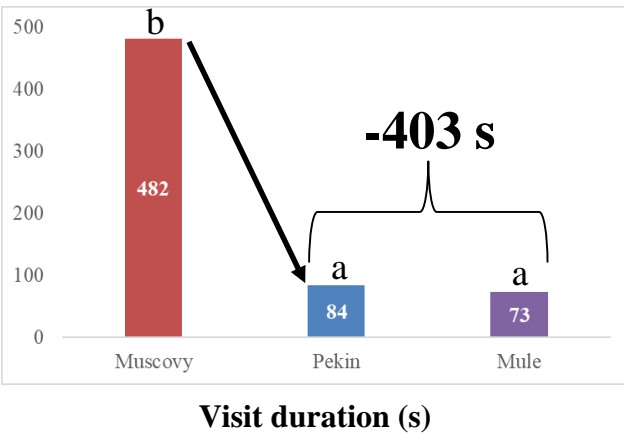


Pekin  $\neq$  Muscovy (\*\*\*)

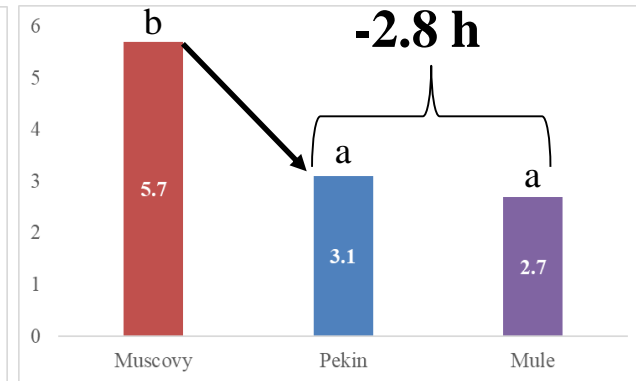
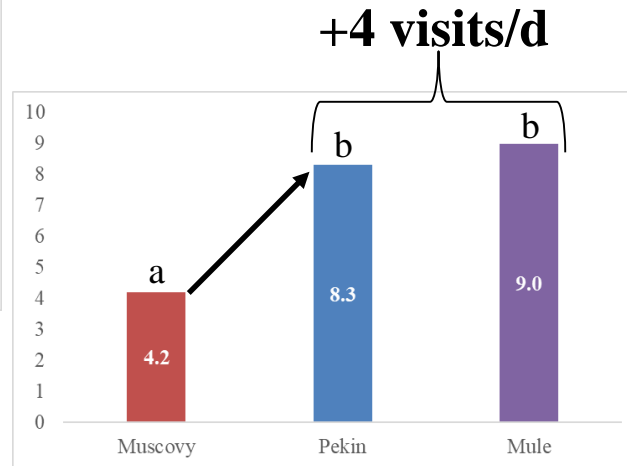
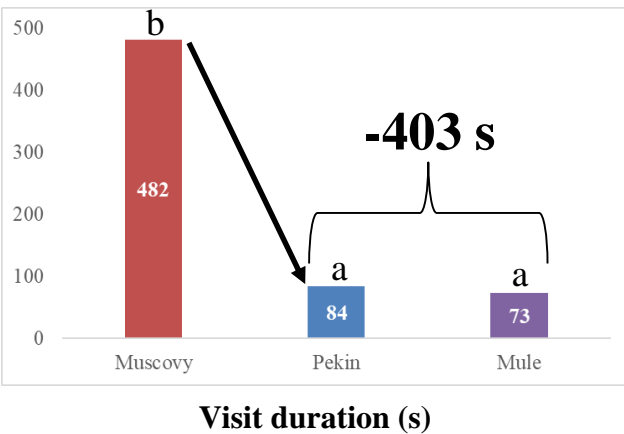
Pekin  $\neq$  Mule (\*\*\*)

Muscovy  $\approx$  Mule

# Feeding Behavior During the Test



# Feeding Behavior During the Test



Number of visit per day

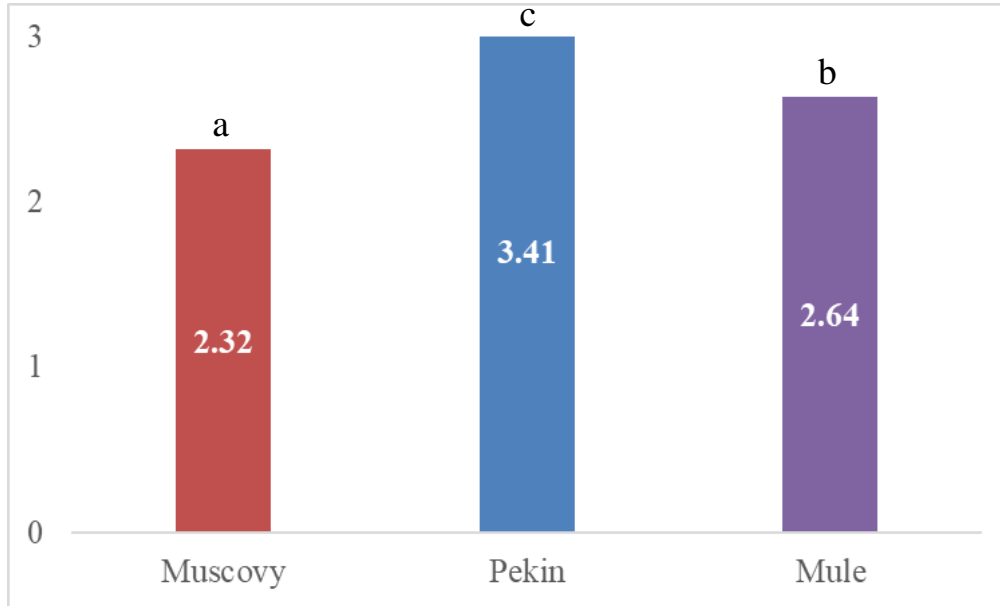
Daily interval between visits (h)



# Feeding Behavior During the Test



Feed conversion ratio



Muscovy < Mule < Pekin (\*\*\*)

If added the part of feed intake during multiple-bird visits (15%)



Feed conversion ratio of Muscovy duck = 2.66

# Conclusion

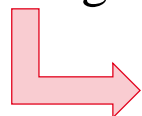


Feeding behavior \ Growth	Muscovy	Pekin	Mule
Muscovy		≠	=
Pekin	≠		≠
Mule	≠	=	

➔ Improvement of the SEF to limit multiple-bird visits, especially for Muscovy ducks:

➔ For better accuracy of feed intake

➔ To describe feeding behavior during other phases of rearing



To select mule ducks from their parents' performances for genetic studies on feed efficiency



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