



Feeding behavior of three breeding duck genetic types during growth

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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

Animals

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

$$\text{trait}_{ijk} = \mu + \text{day}_i + \text{line}_j + \text{day}_i \times \text{line}_j + a_k + \varepsilon_{ijk}$$

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

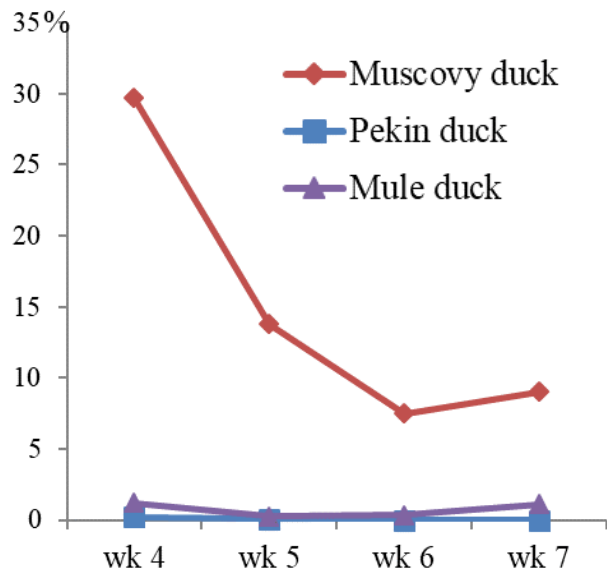
For the entire trial

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

line _j	3 levels (Muscovy, Pekin, and mule ducks)
ε _{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:

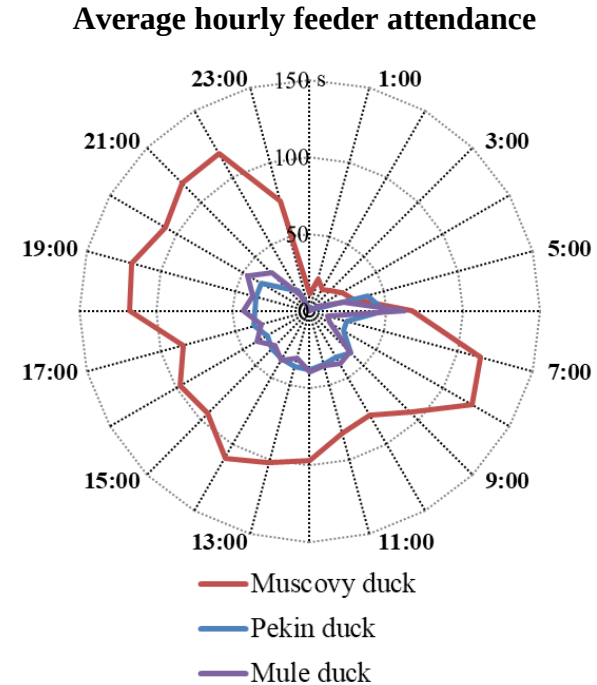
→ Week 4 data discarded

→ Individual feed intake +/- underestimated

A Typical Day at the SEF during Growth



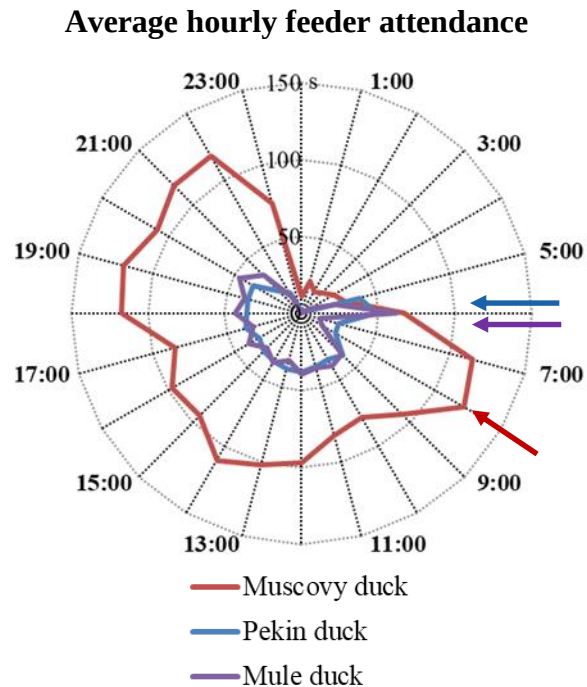
- Per hour $\rightarrow \approx + 54$ s for Muscovy ducks in SEF



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

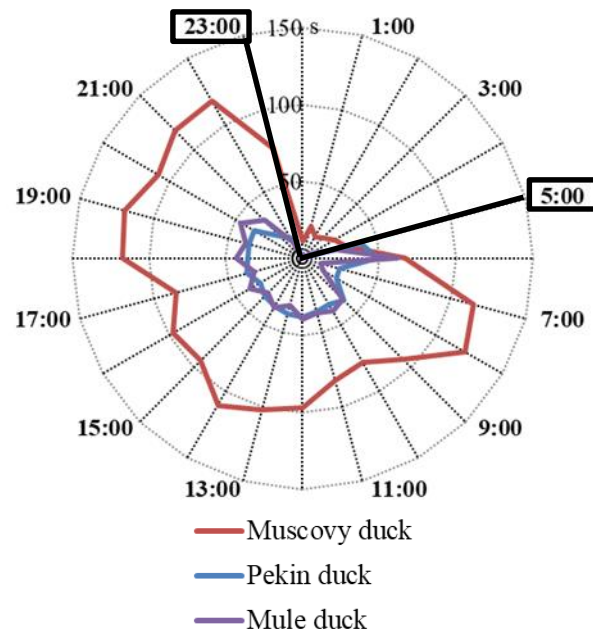


A Typical Day at the SEF during Growth



- 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

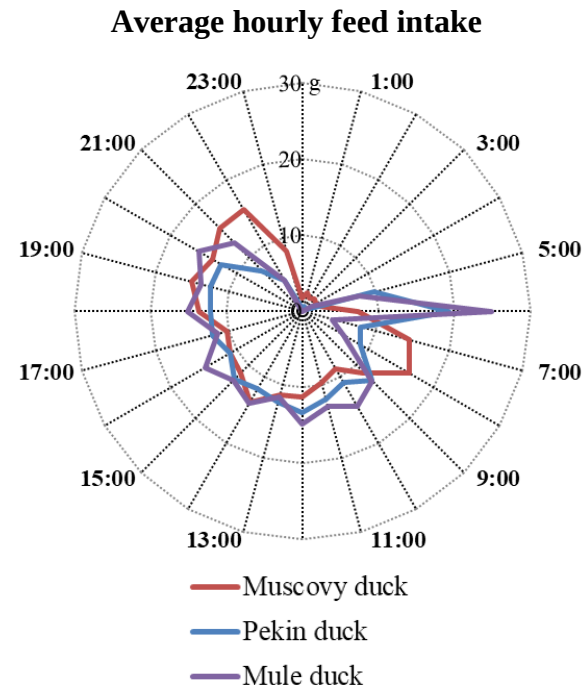
Average hourly feeder attendance



A Typical Day at the SEF during Growth



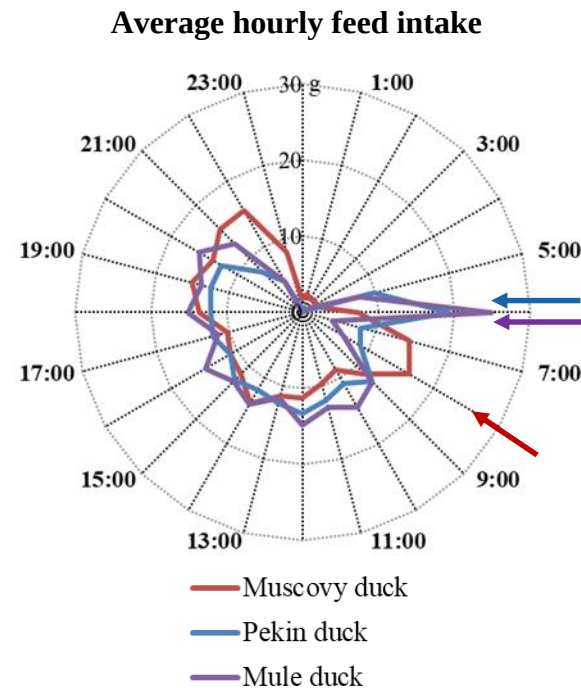
- Per hour → no difference in feed intake between genetic types



A Typical Day at the SEF during Growth



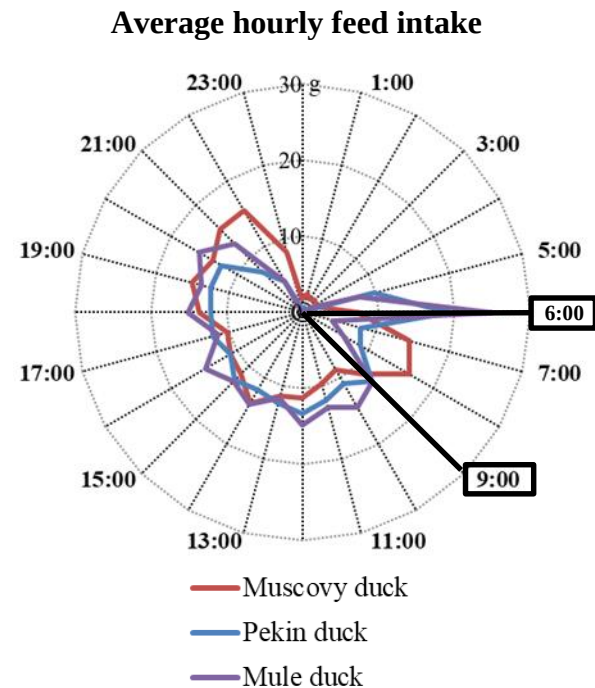
- Per hour → no difference in feed intake between genetic types
- At 8:00 → feeding peak for Muscovy ducks
At 6:00 → feeding peak for Pekin and mule ducks



A Typical Day at the SEF during Growth



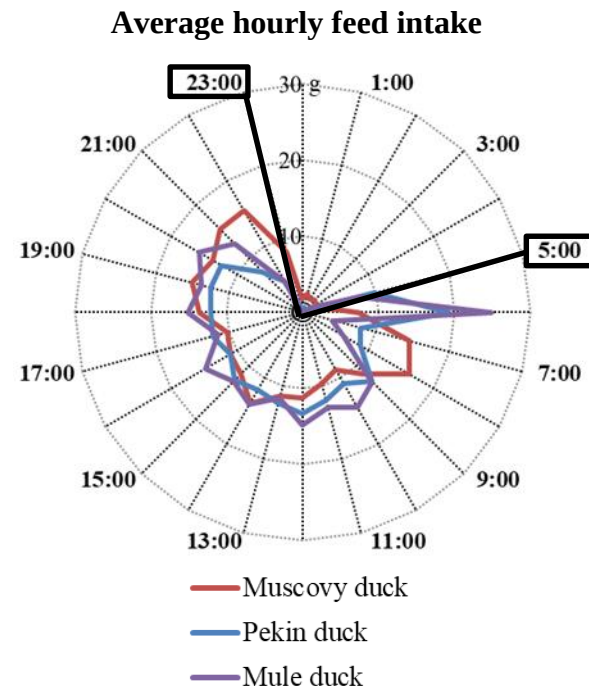
- Per hour → no difference in feed intake between genetic types
- At 8:00 → feeding peak for Muscovy ducks
At 6:00 → feeding peak for Pekin and mule ducks
- Between 6:00 and 9:00 → more than 20% of the daily ration eaten per animal of each genetic type
- After 9:00 → feed intake stable



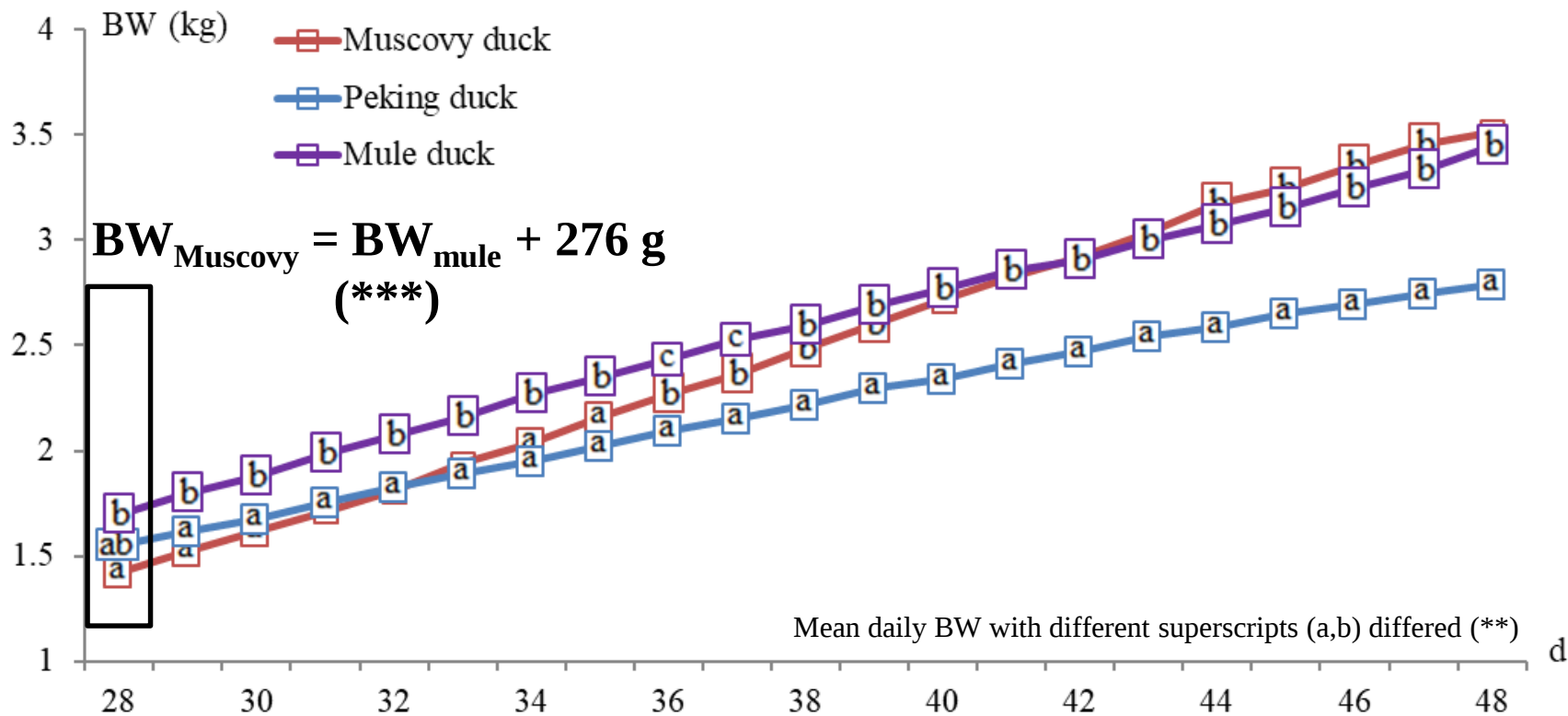
A Typical Day at the SEF during Growth



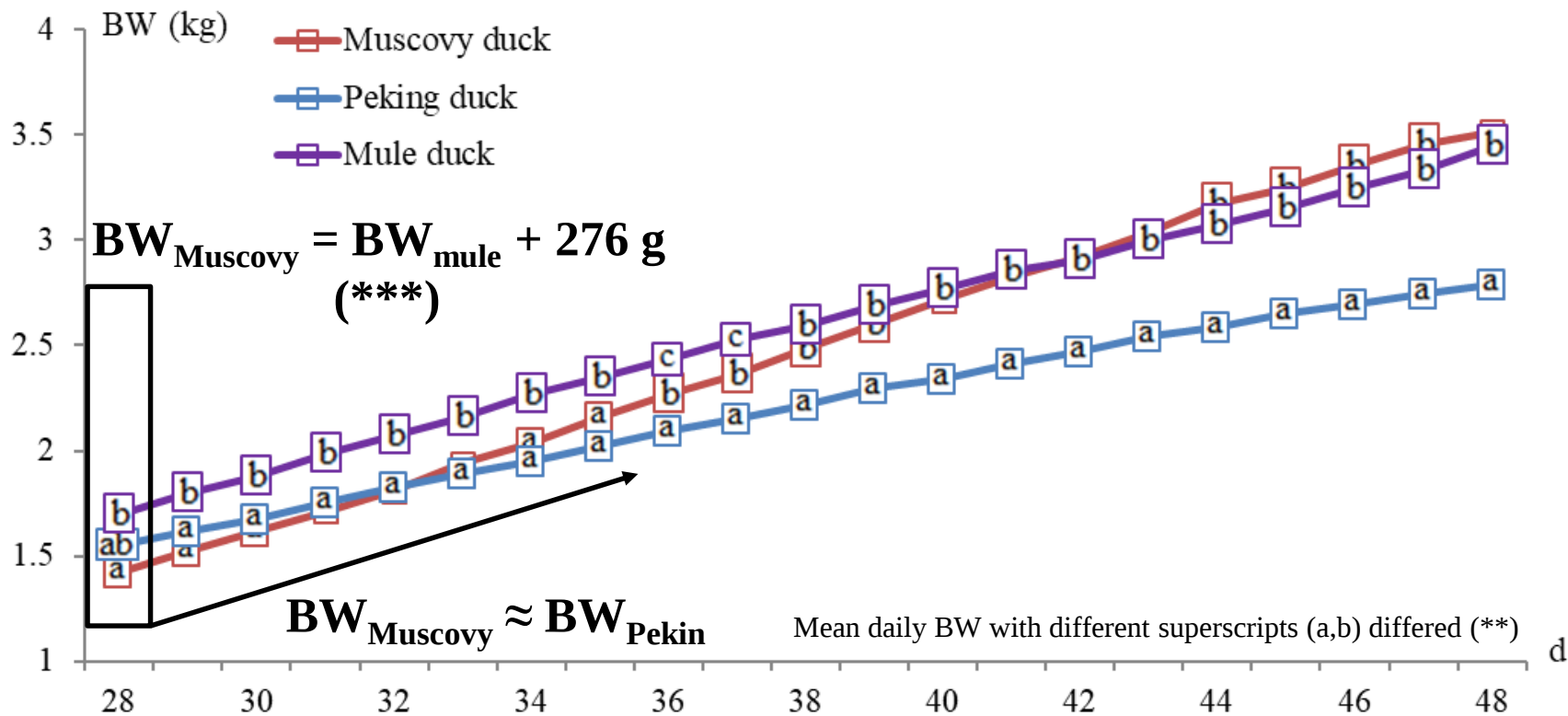
- Per hour → no difference in feed intake between genetic types
- At 8:00 → feeding peak for Muscovy ducks
At 6:00 → feeding peak for Pekin and mule ducks
- Between 6:00 and 9:00 → more than 20% of the daily ration eaten per animal of each genetic type
- After 9:00 → feed intake stable
- During night,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



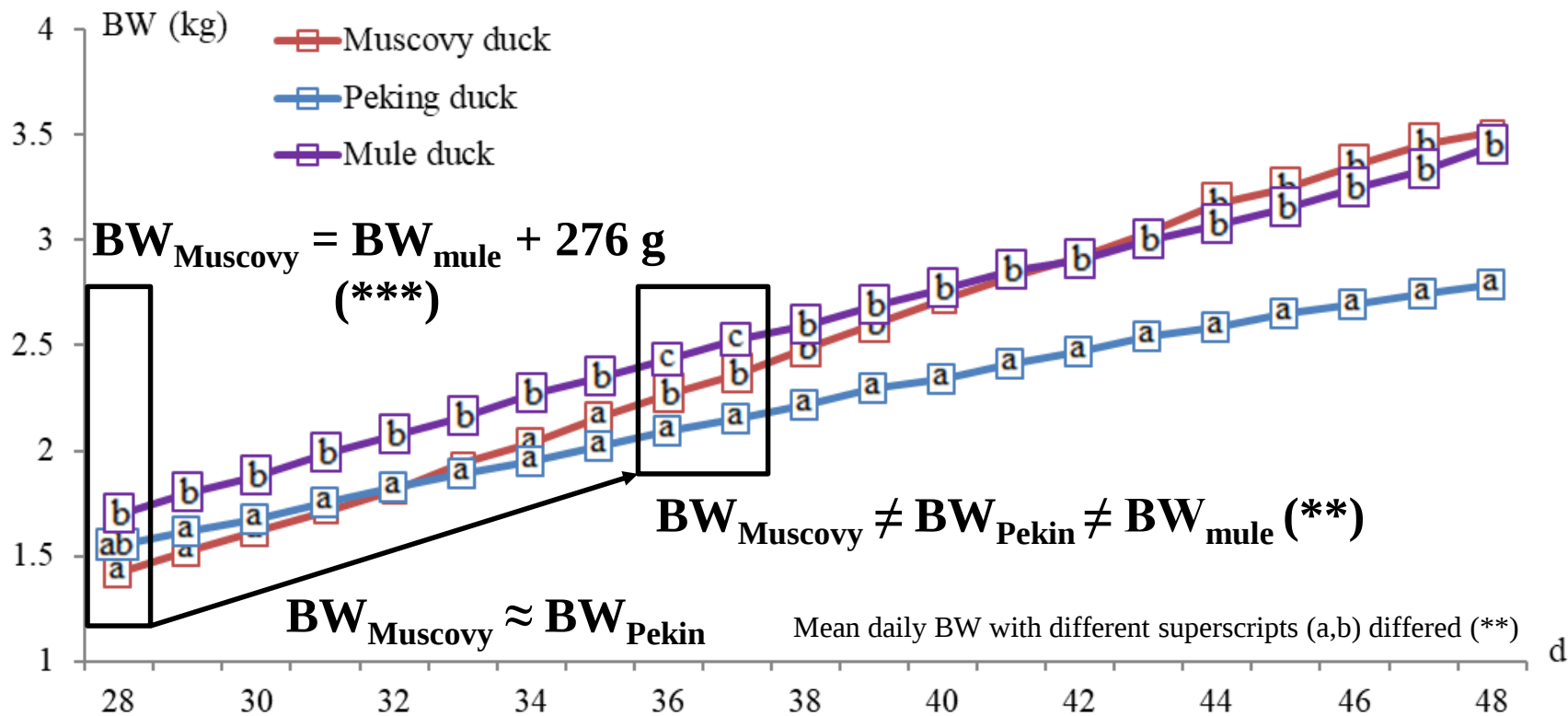
Growth Characteristics from d 28 to 49



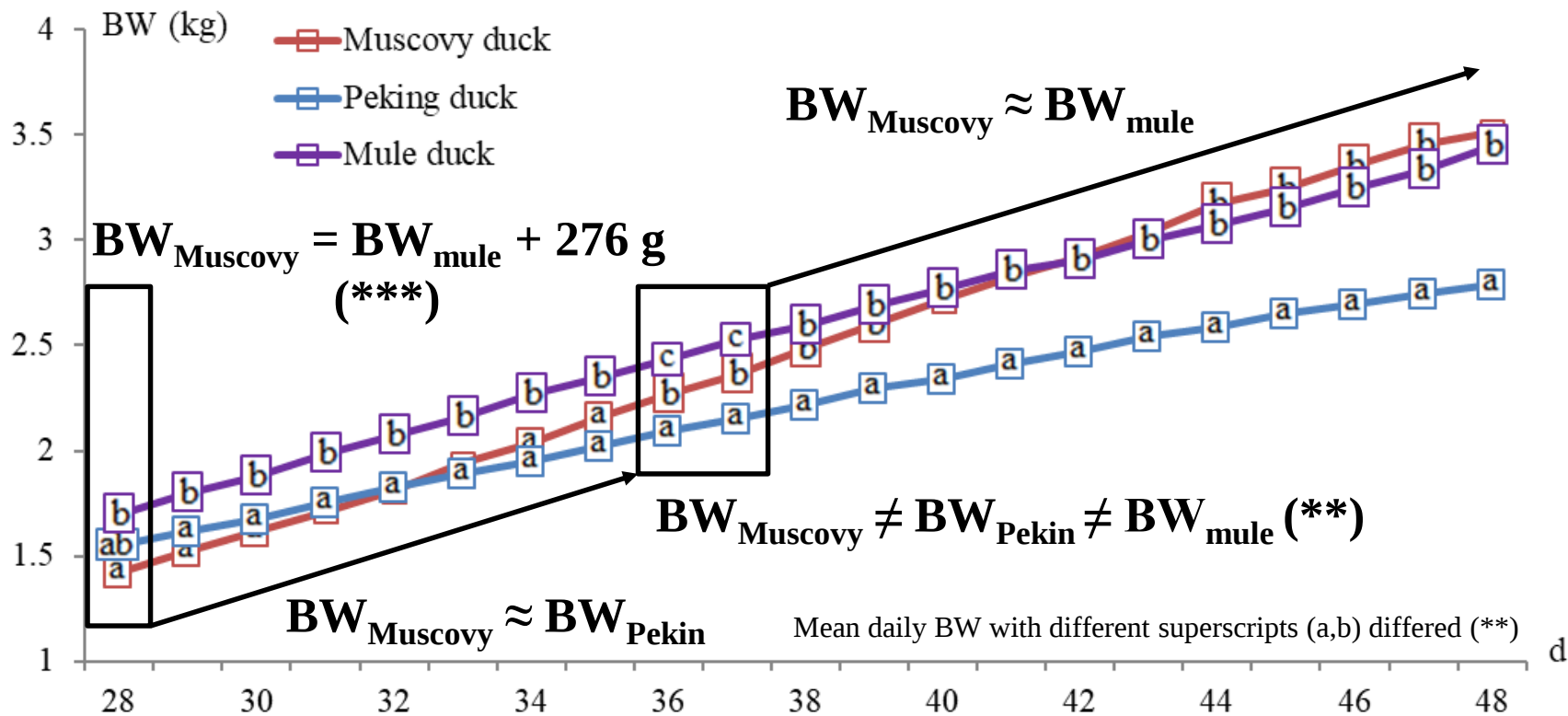
Growth Characteristics from d 28 to 49



Growth Characteristics from d 28 to 49

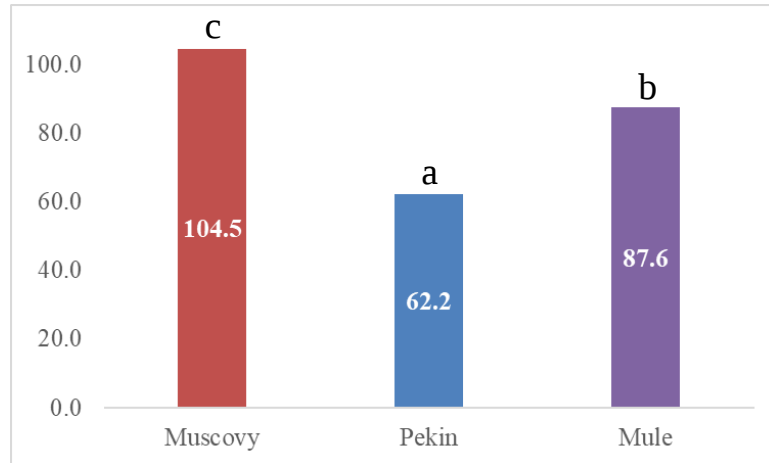


Growth Characteristics from d 28 to 49



Growth and Feeding Behavior During the Test

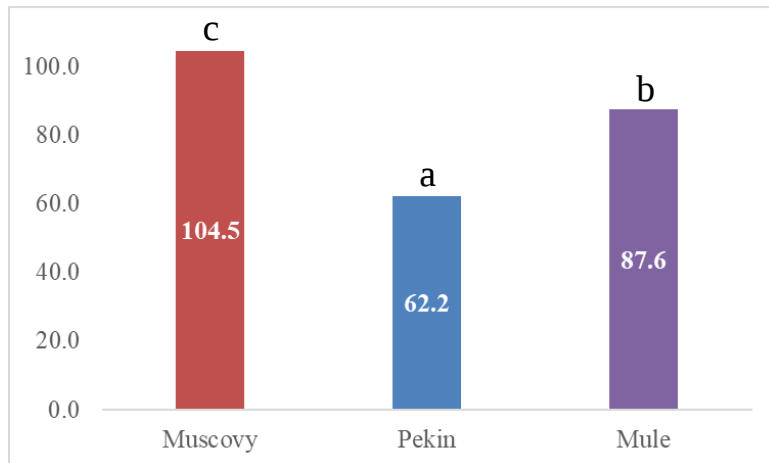
Average daily gain (g/d)



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

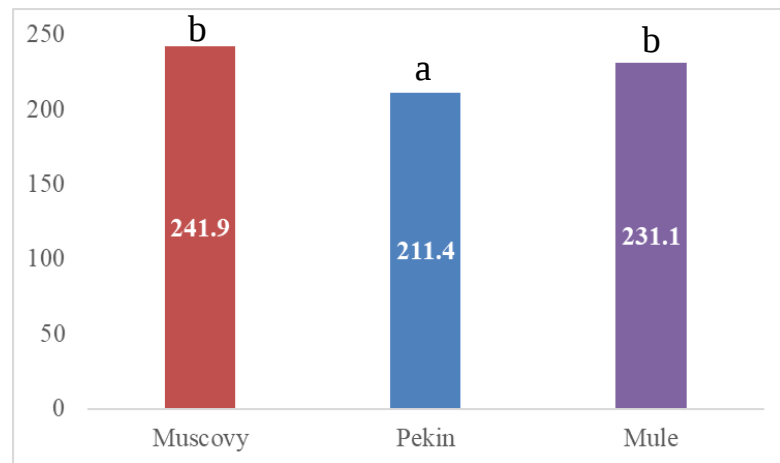
Growth and Feeding Behavior During the Test

Average daily gain (g/d)



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

Daily feed intake (g/d)

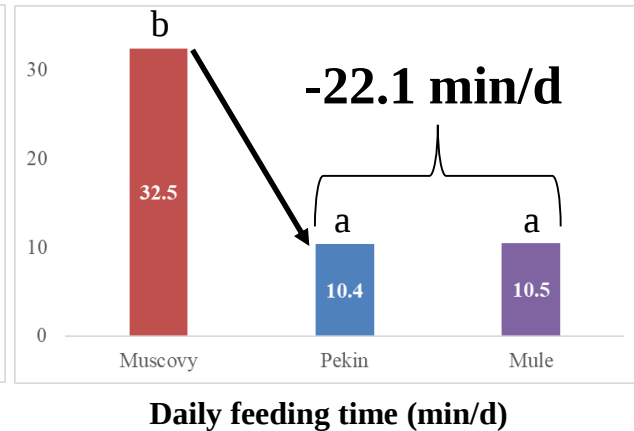
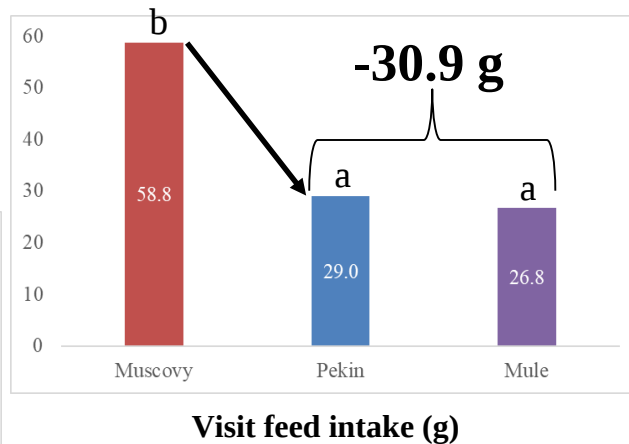
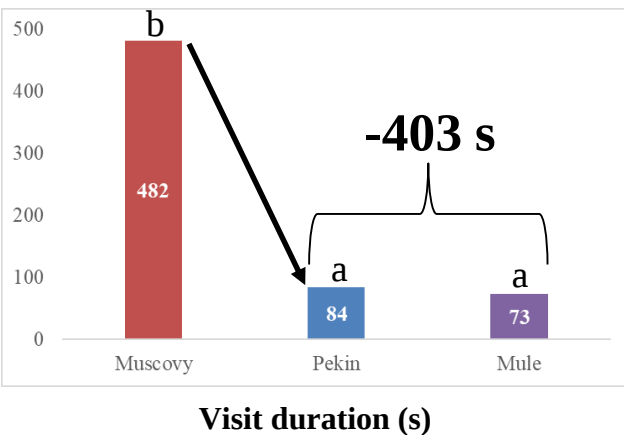


Pekin $\neq$ Muscovy (***)

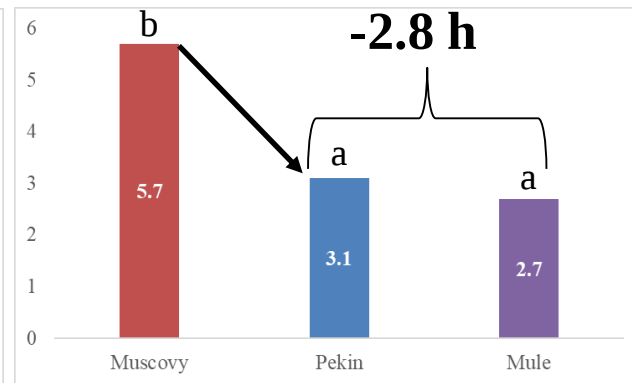
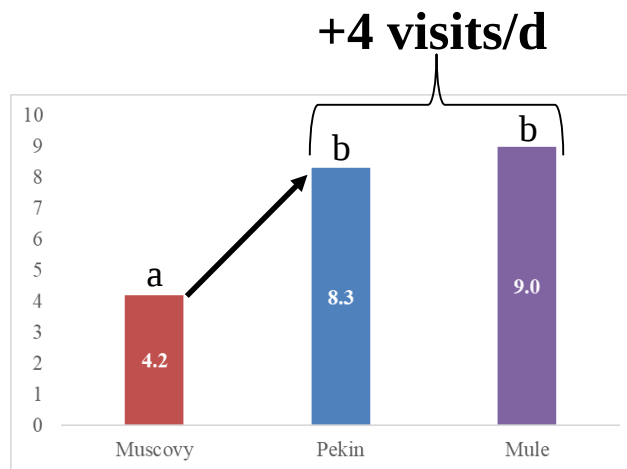
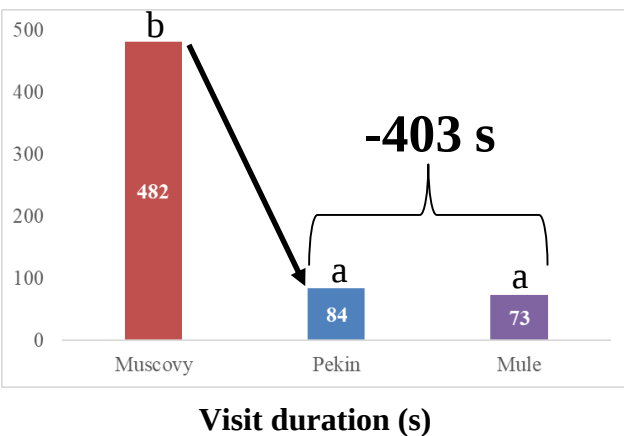
Pekin $\neq$ Mule (***)

Muscovy $\approx$ Mule

Feeding Behavior During the Test

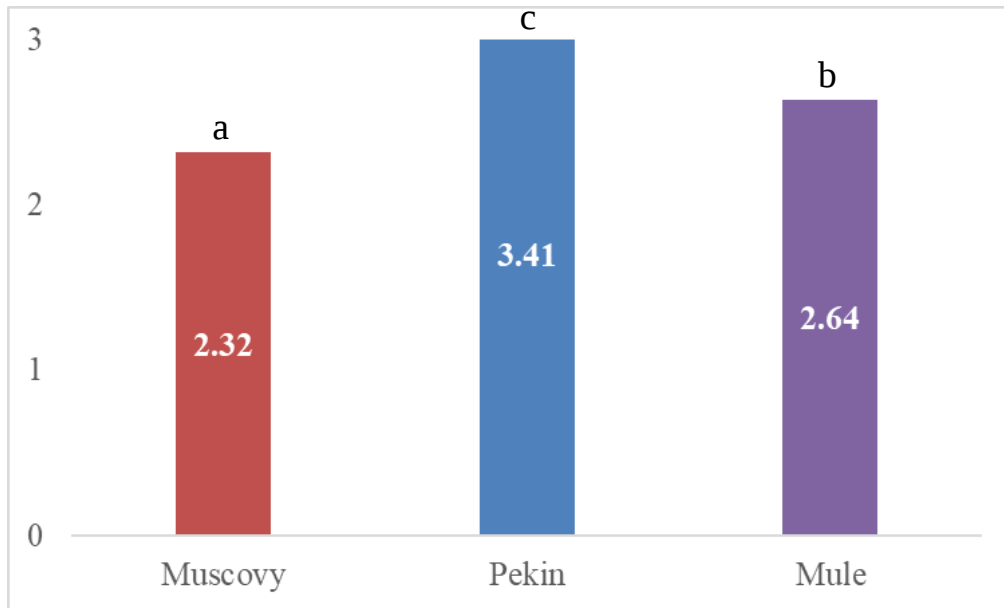


Feeding Behavior During the Test



Feeding Behavior During the Test

Feed conversion ratio



Muscovy < Mule < Pekin (***)

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



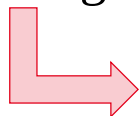
Feed conversion ratio of Muscovy
duck = 2.66

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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