

# Is gut functionality a limitation for maximizing growth in broilers?

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**Strain**

**1957**

**1978**

**2005**



**0 d**

34 g

42 g

44 g



**28 d**

316 g

632 g

1,396 g



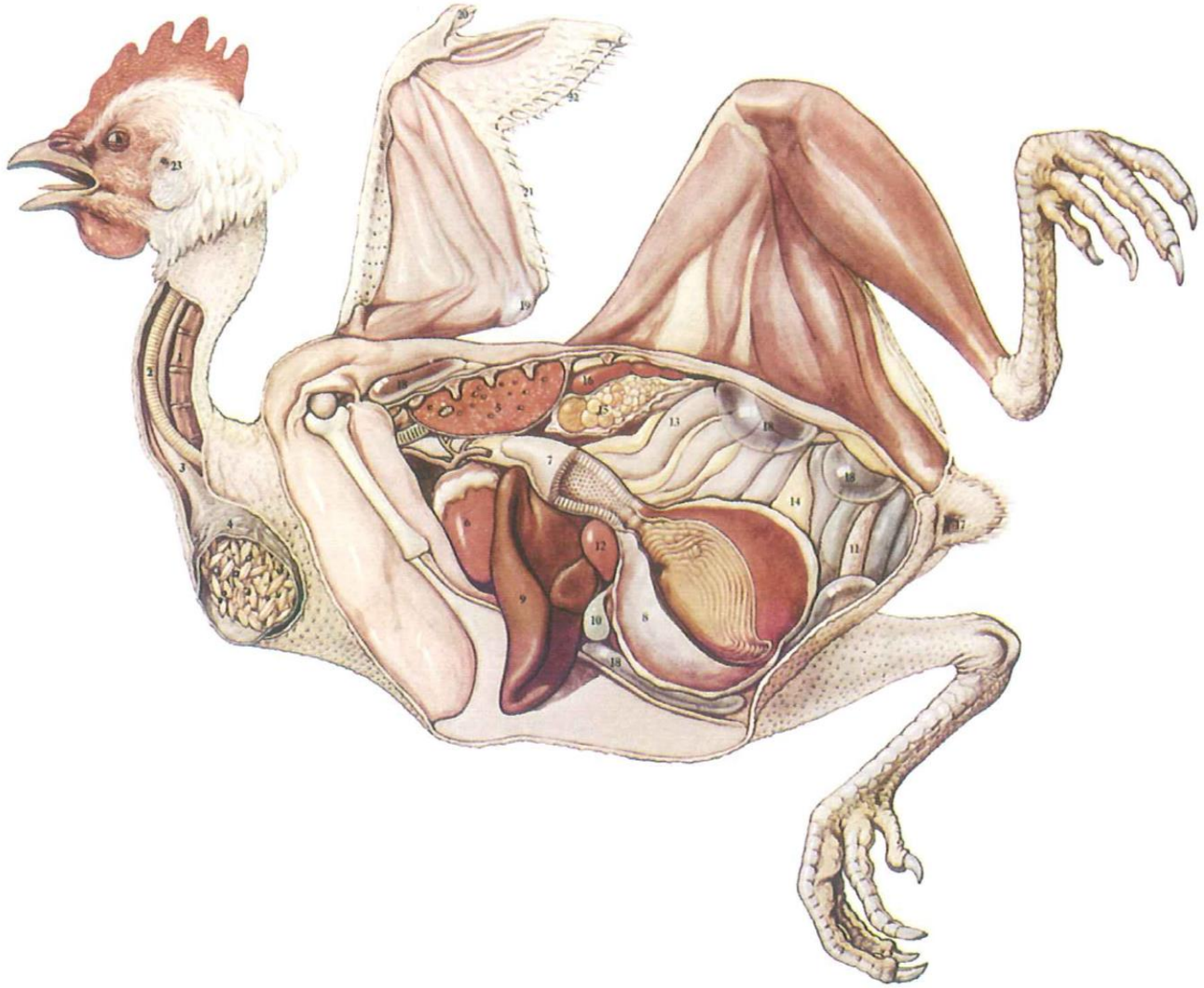
**56 d**

905 g

1,808 g

4,202 g

Zuidhof et al., 2014.  
Poultry Science 93:  
2970–2982



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**F/G**

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**1.7**

**1.5**



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***All else the  
same, feed  
efficiency will  
always improve  
when growth  
increases***

# Main questions

- Is feed intake capacity an issue due to limitation in gut volume or motivation for eating?
- Is nutrient digestion and absorption capacity a limitation
- Is metabolism of nutrients a limitation

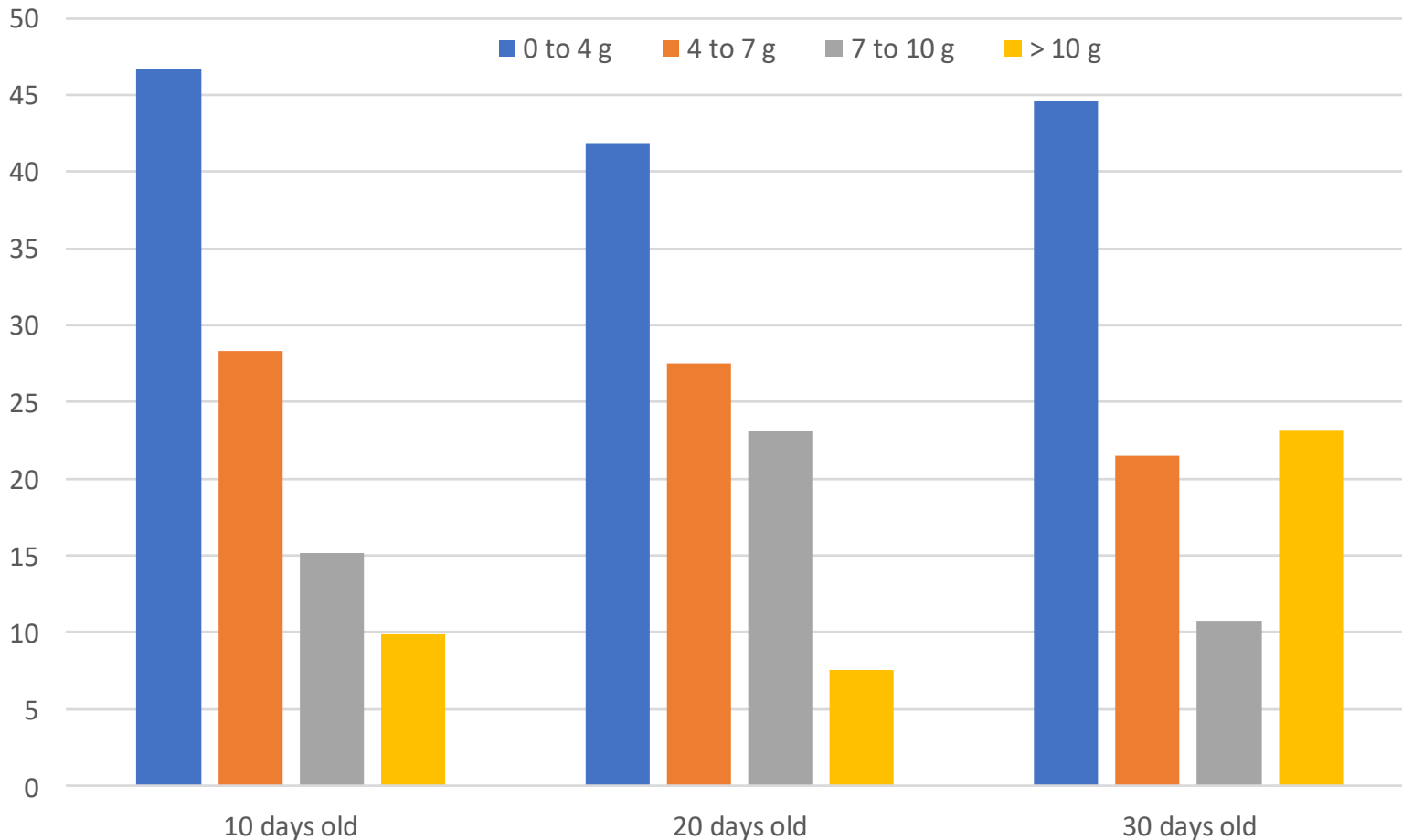
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«Much of the reduction in age at market weight has been attributed to increased feed consumption, and it is now well established that meat type chickens are overeaters, beginning first week posthatching and perhaps as early as the first day»  
Paul B. Siegel (1987) CRC Critical Reviews in Poultry Biology 1, 1)

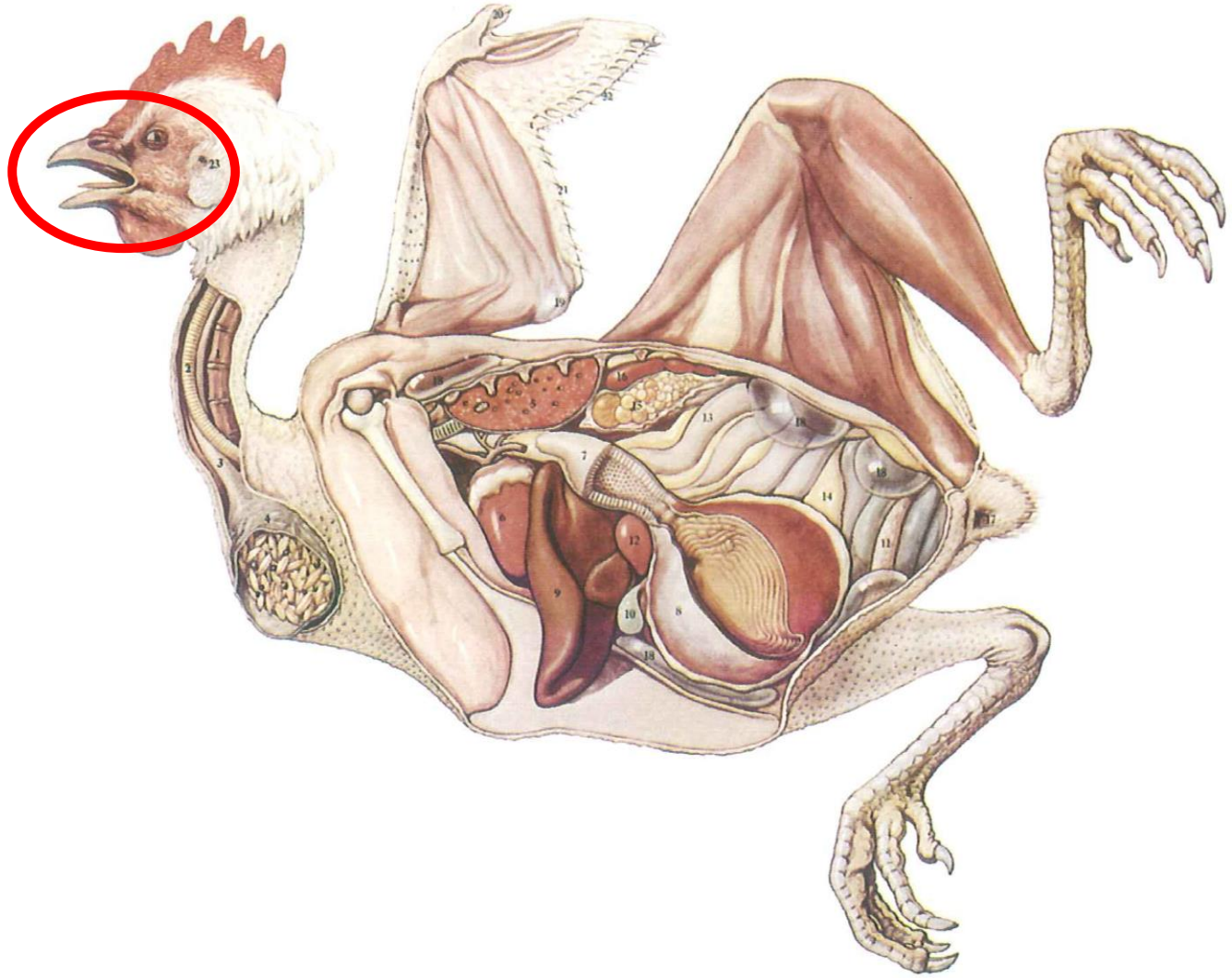
# Percentage distribution of broilers according to amount of feed DM in the crop

(Kristoffersen et al. (2022) Br Poult Sci In press)



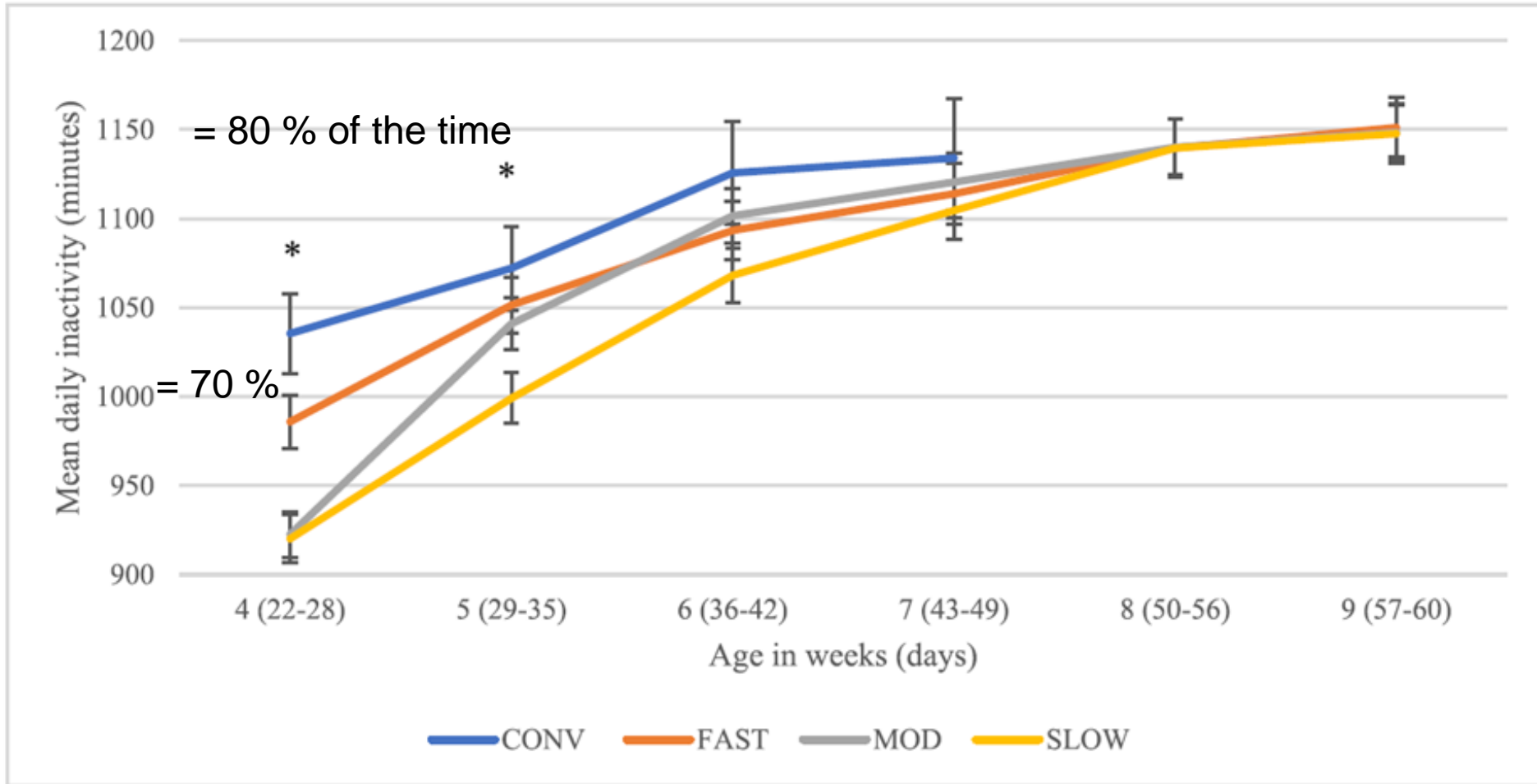
For each age, 40 random *ad libitum* fed birds each from 4 different commercial farms were selected and killed to collect crop contents







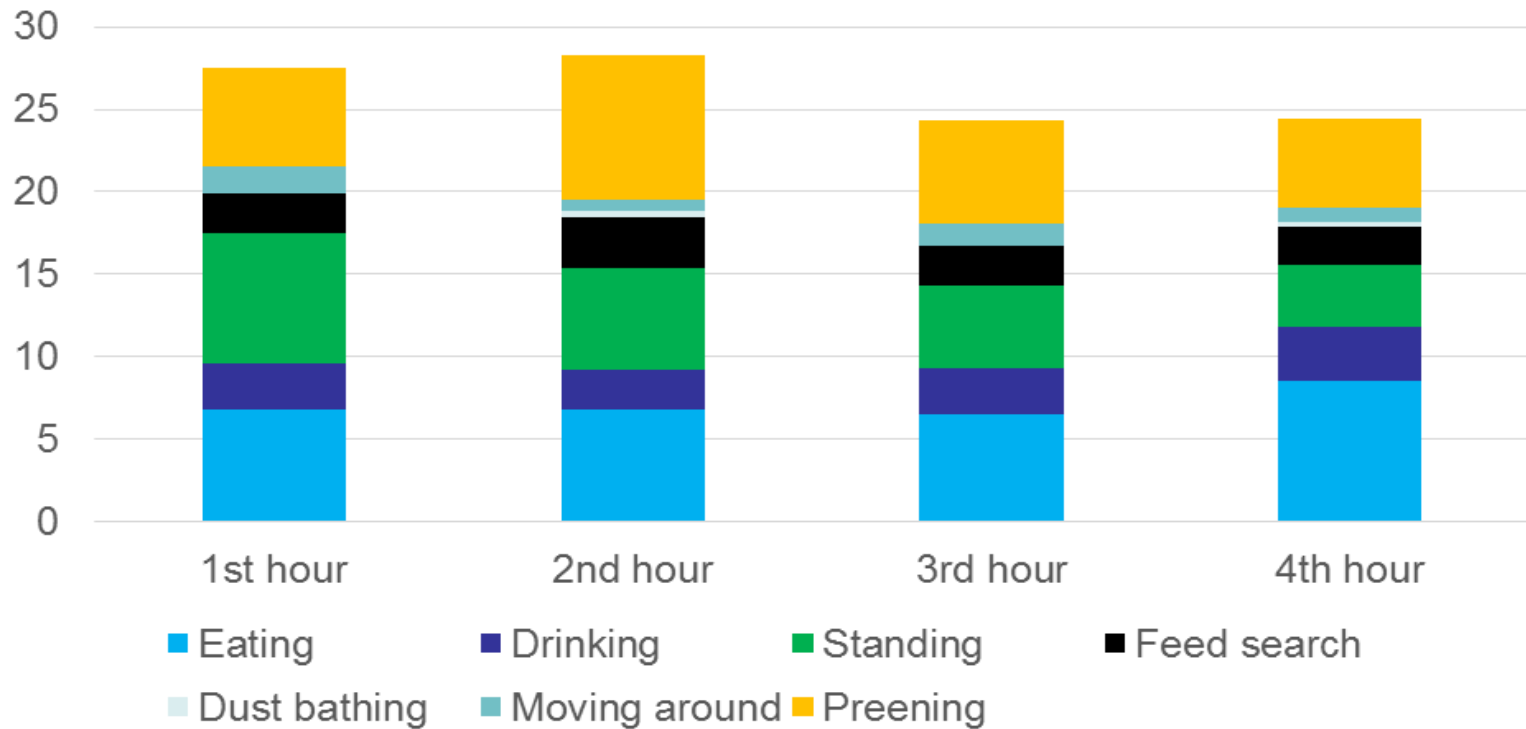
# Lazy birds: resting time at different ages for fast- and slower-growing broilers fed pellets



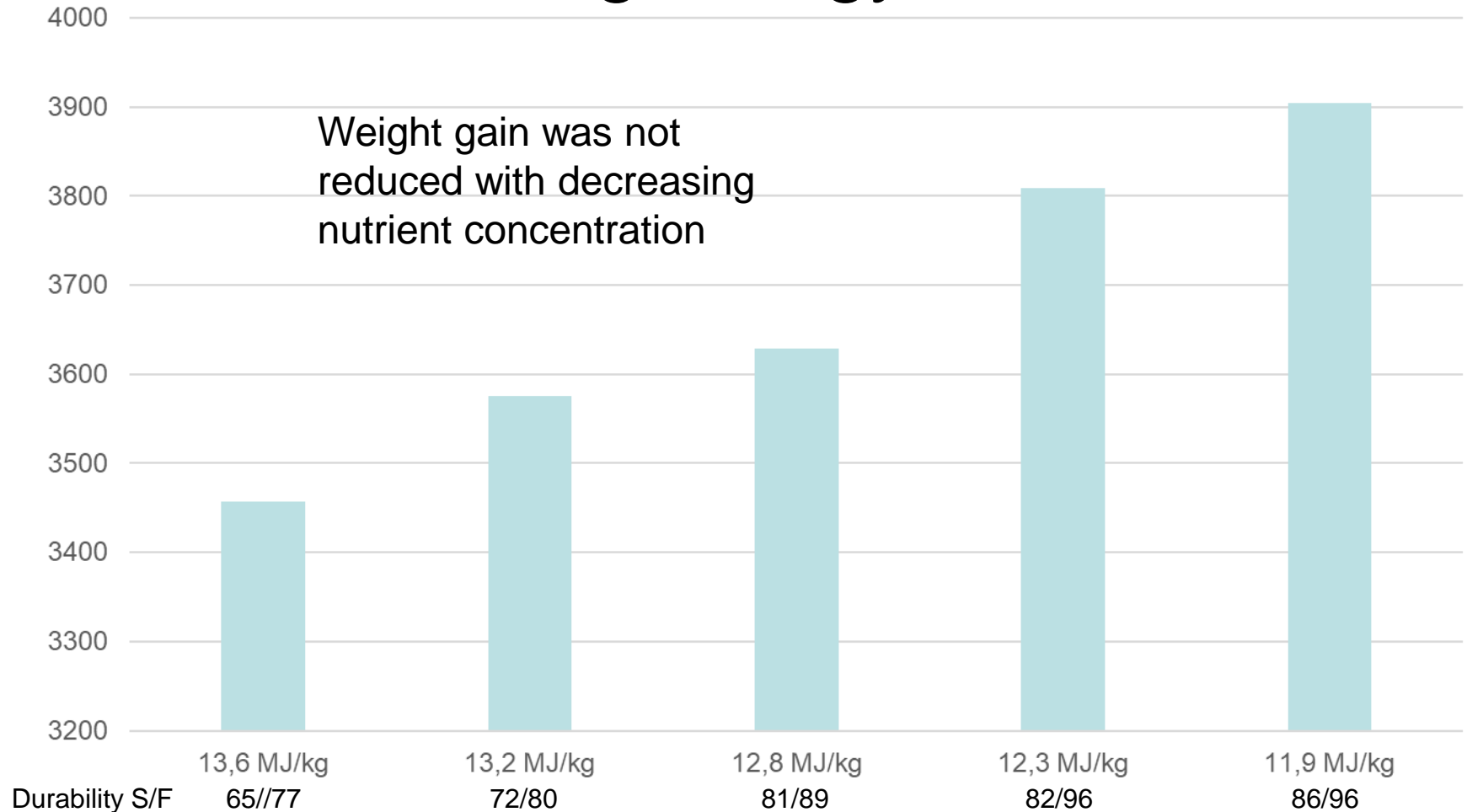
# Behaviour of ad libitum fed birds

(Svihus et al. 2013. Br Poult Sci 54, 222)

## Ad libitum fed broilers



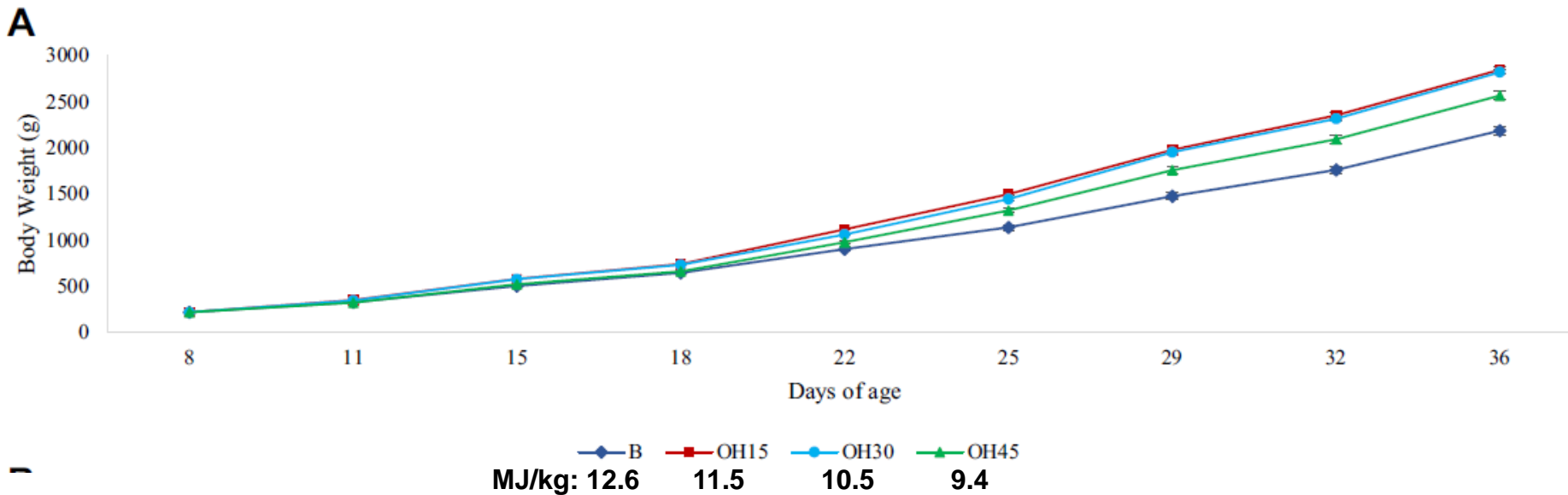
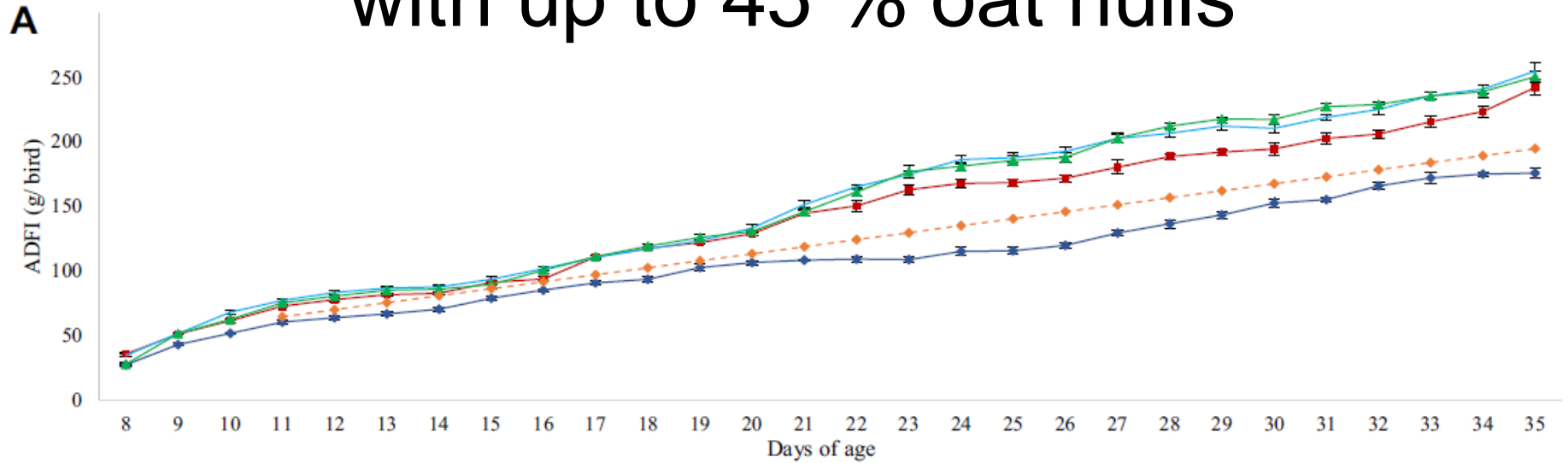
# Feed intake in g from 10 to 35 days of age of broiler chickens given pelleted diets with decreasing energy concentration



Hamungalu et al. (2020) Anim. Feed Sci. Technol. 268, 114613

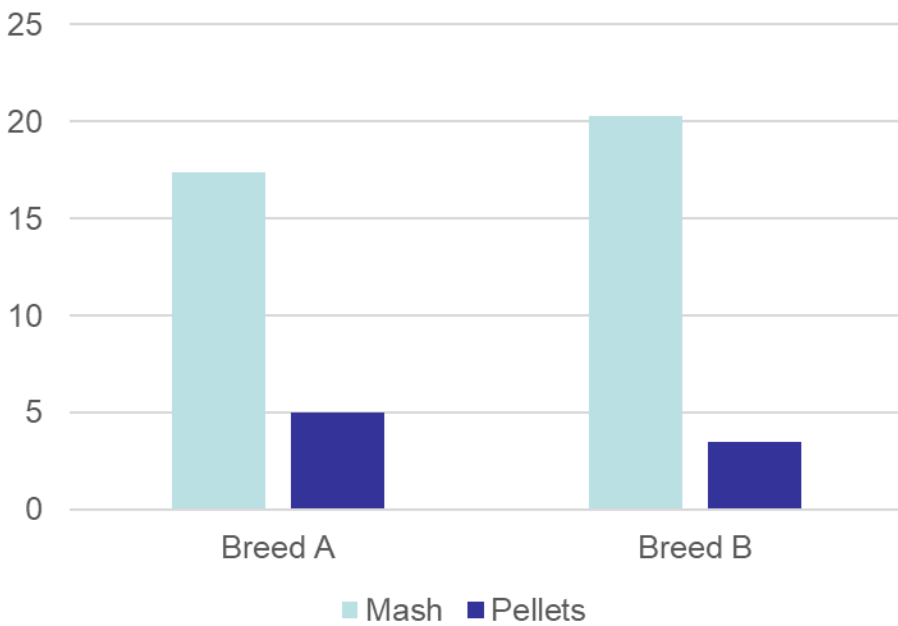


# Dilution of a pelleted basal (B) broiler diet with up to 45 % oat hulls

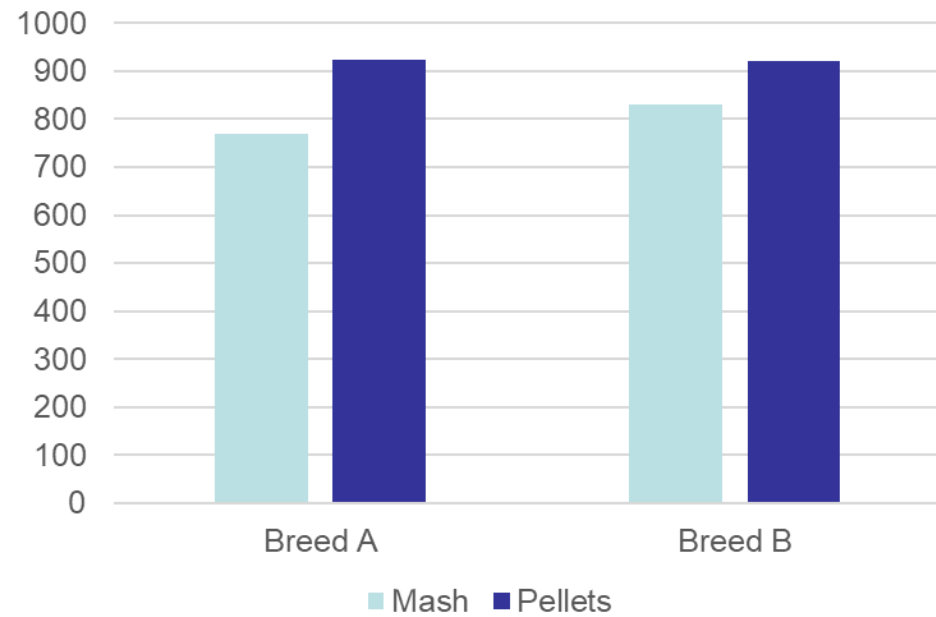


# Eating behaviour of two different fast-growing breeds of broilers between 23 and 30 days of age

Observed eating, % of time



Feed intake, g



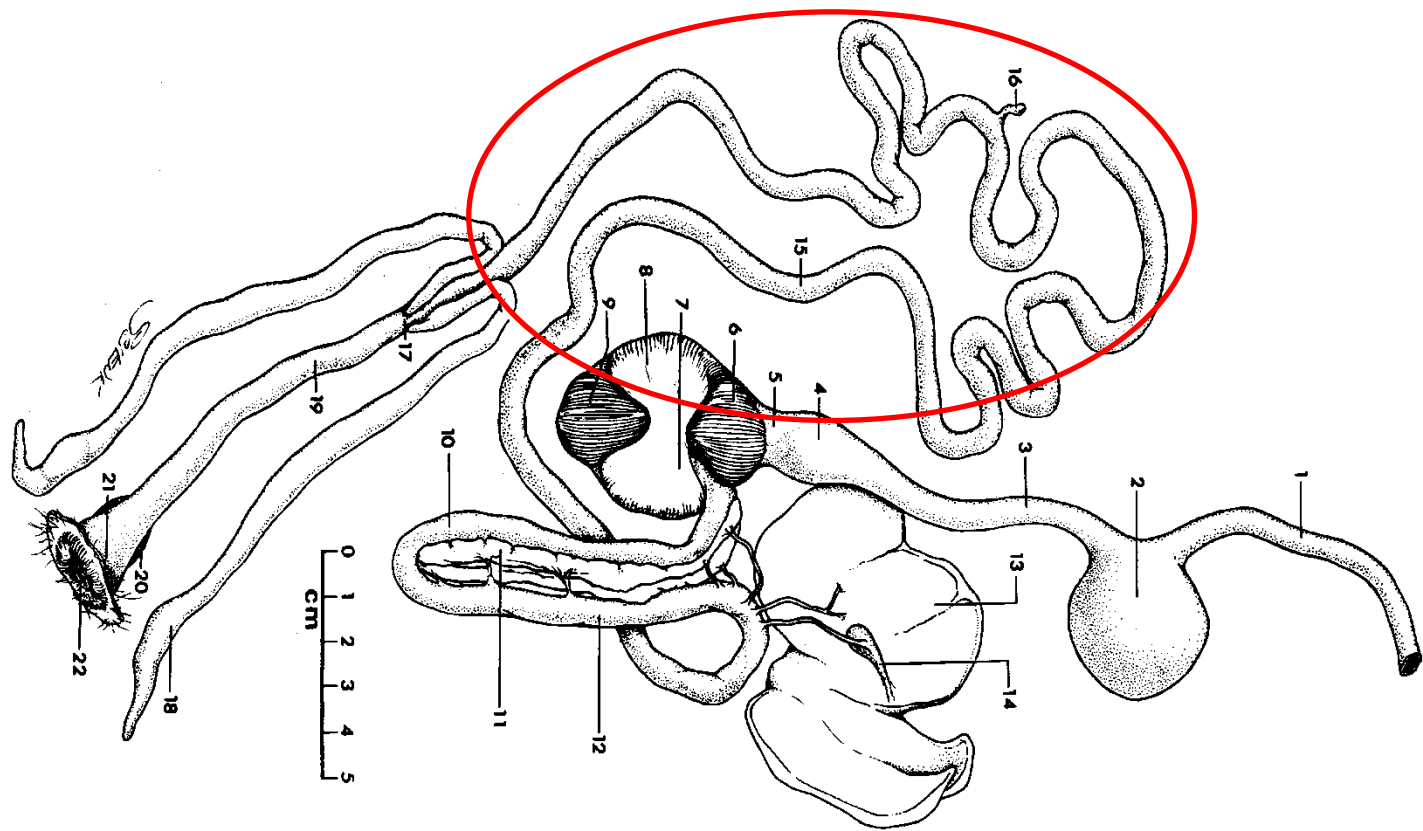
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  - No, at least not with pelleted diets with a sufficient durability
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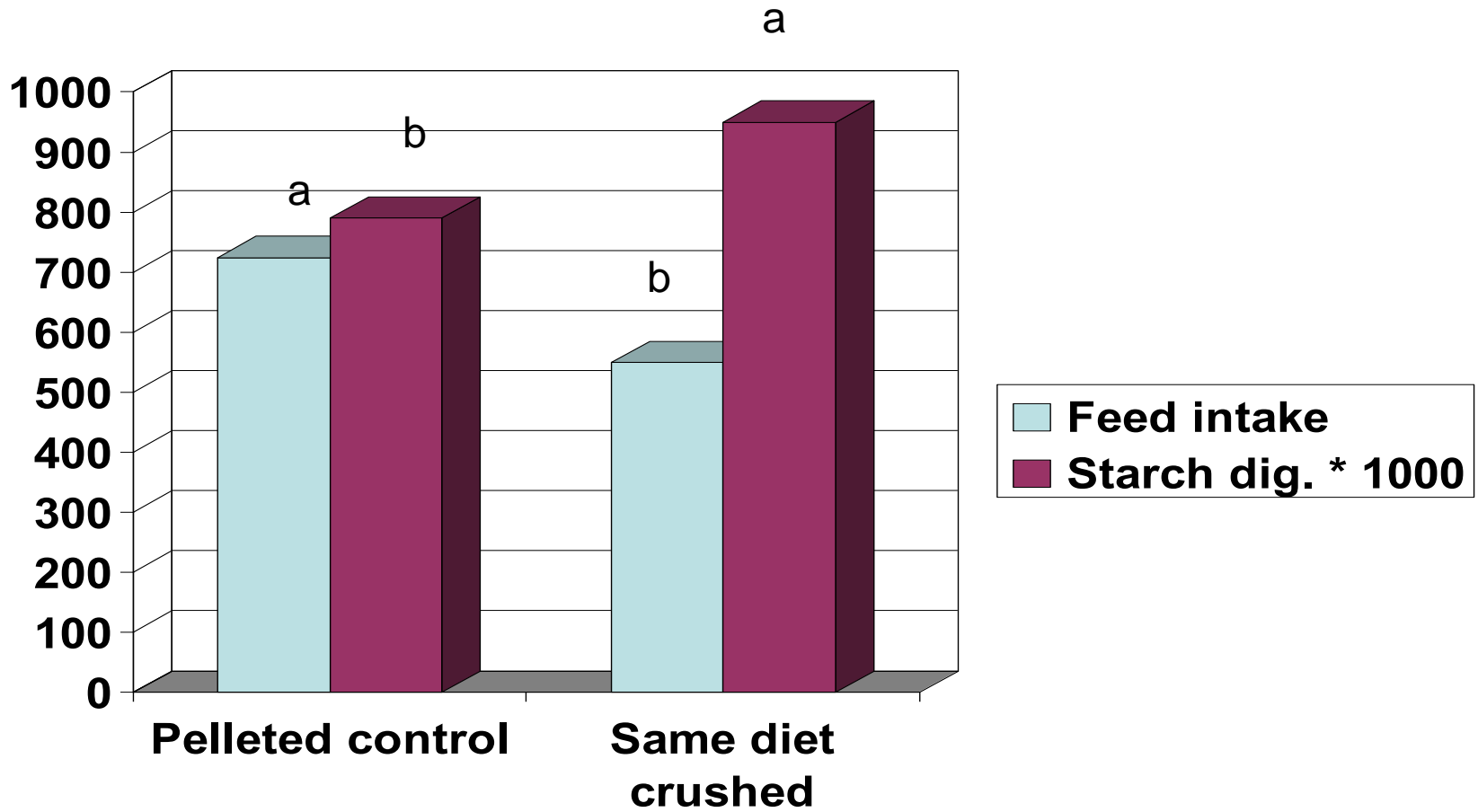
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## Typical values and normal ranges for digestive tract conditions

	Water content, %	pH	Retention time, h
Crop	50 (10 to 70)	5.0 (4 to 6.5)	0.5 (0 to 6)
Prov. + gizzard	65 (40 to 80)	3.5 (2 to 5)	1.0 (0.5 to 3)
<b>Small intestine</b>	<b>85 (75 to 90)</b>	<b>6.5 (6 to 7.5)</b>	<b>3.0 (2 to 4)</b>
Ceca	87 (80 to 90)	6.0 (5 to 7)	12.0 (6 to 48)

# Effect of feed form on starch digestibility (Svihus and Hetland 2001, British Poultry Science 42, 663)

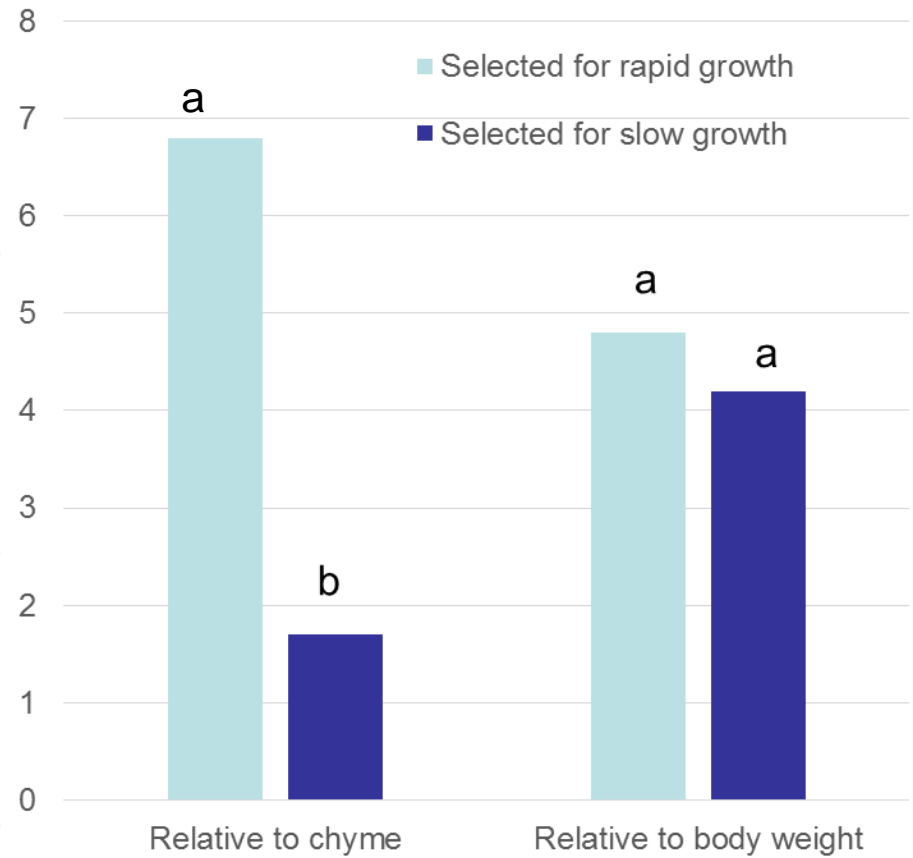
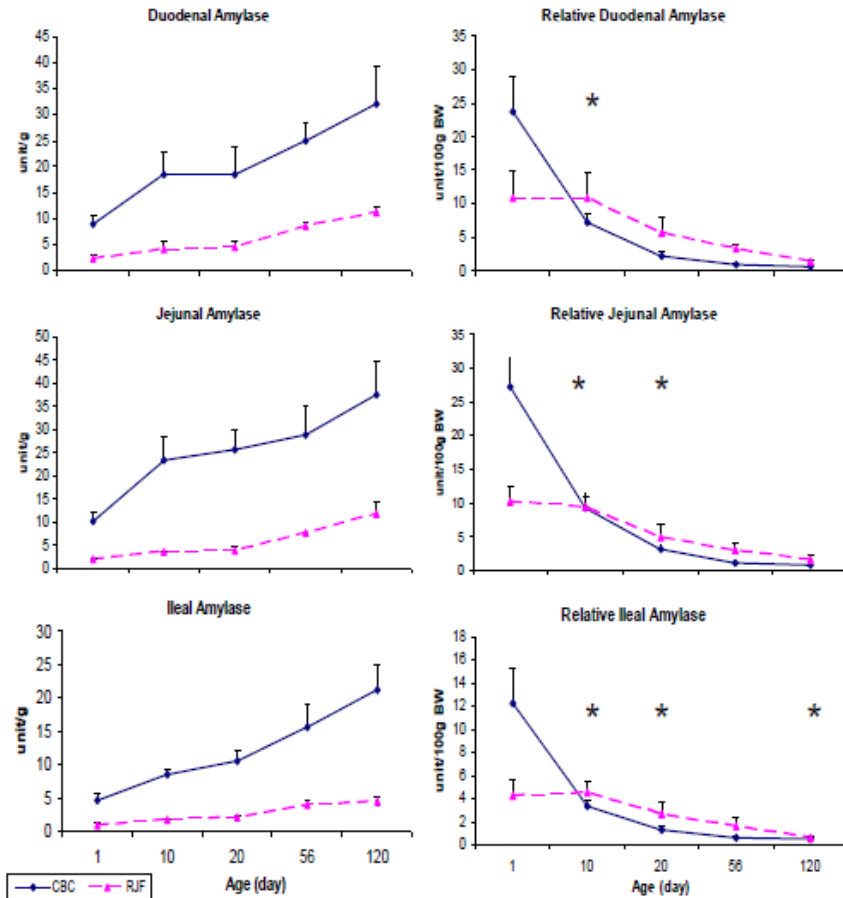


# Effect of pelleting on broiler performance from 0 to 21 days of age

	<b>Pelleted after conditioning at 75 C</b>	<b>Mash without conditioning</b>
Feed intake	1227a	1126b
Weight gain	981a	873b
Feed/gain	1.35a	1.29b
Protein digestibility	0.85	0.85
Starch digestibility	0.81b	0.96a
AME	13.7b	14.1a

Abdollahi et al. (2011) Anim. Feed Sci. Technol. 168, 88– 99

# Amylase secretion in the digestive tract of fast-growing broilers compared to slower-growing birds

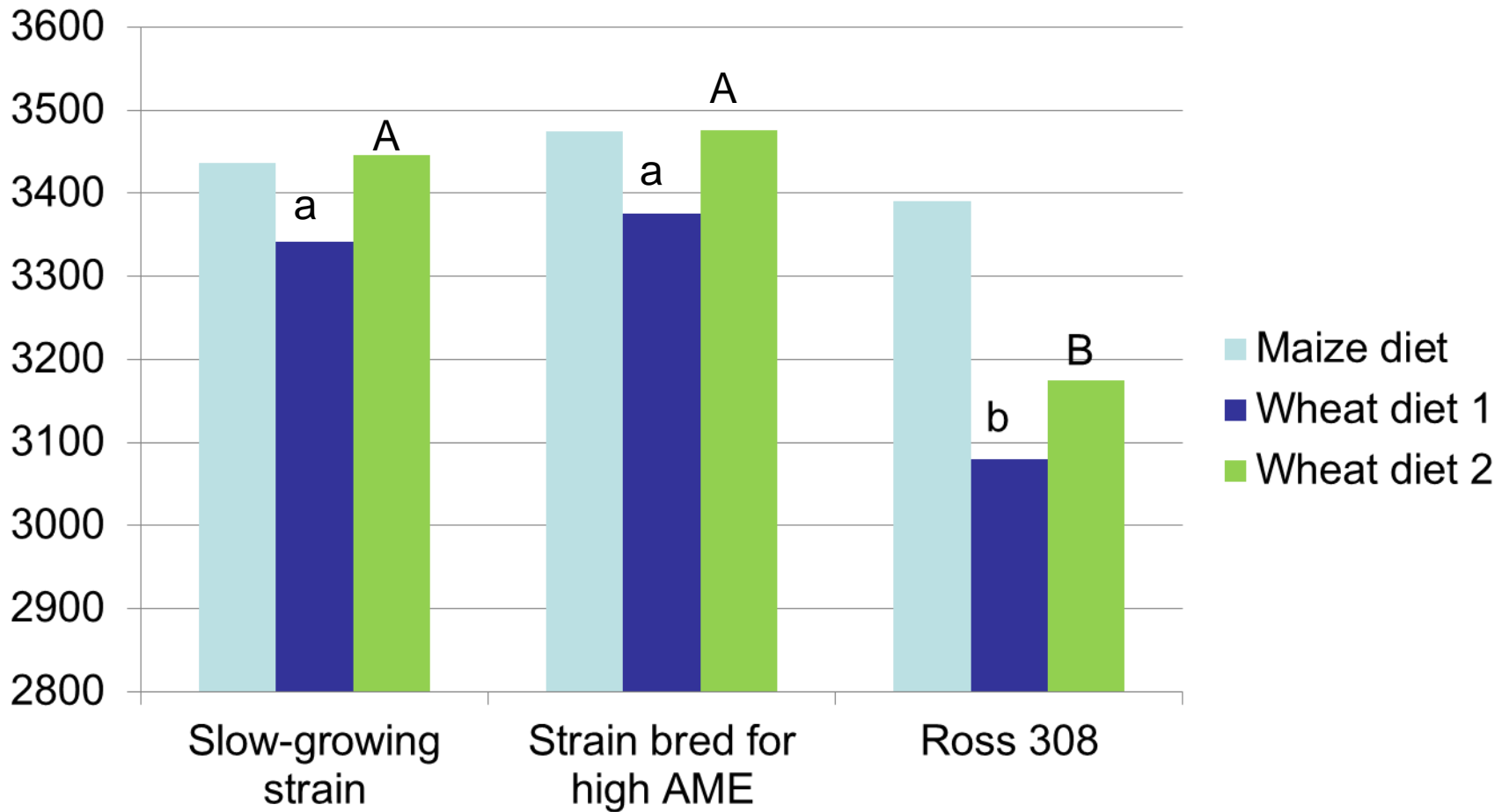


Compared with red jungle fowl (RJB)

(Kadhim et al. (2011) African Journal of Biotechnology 10, 108)

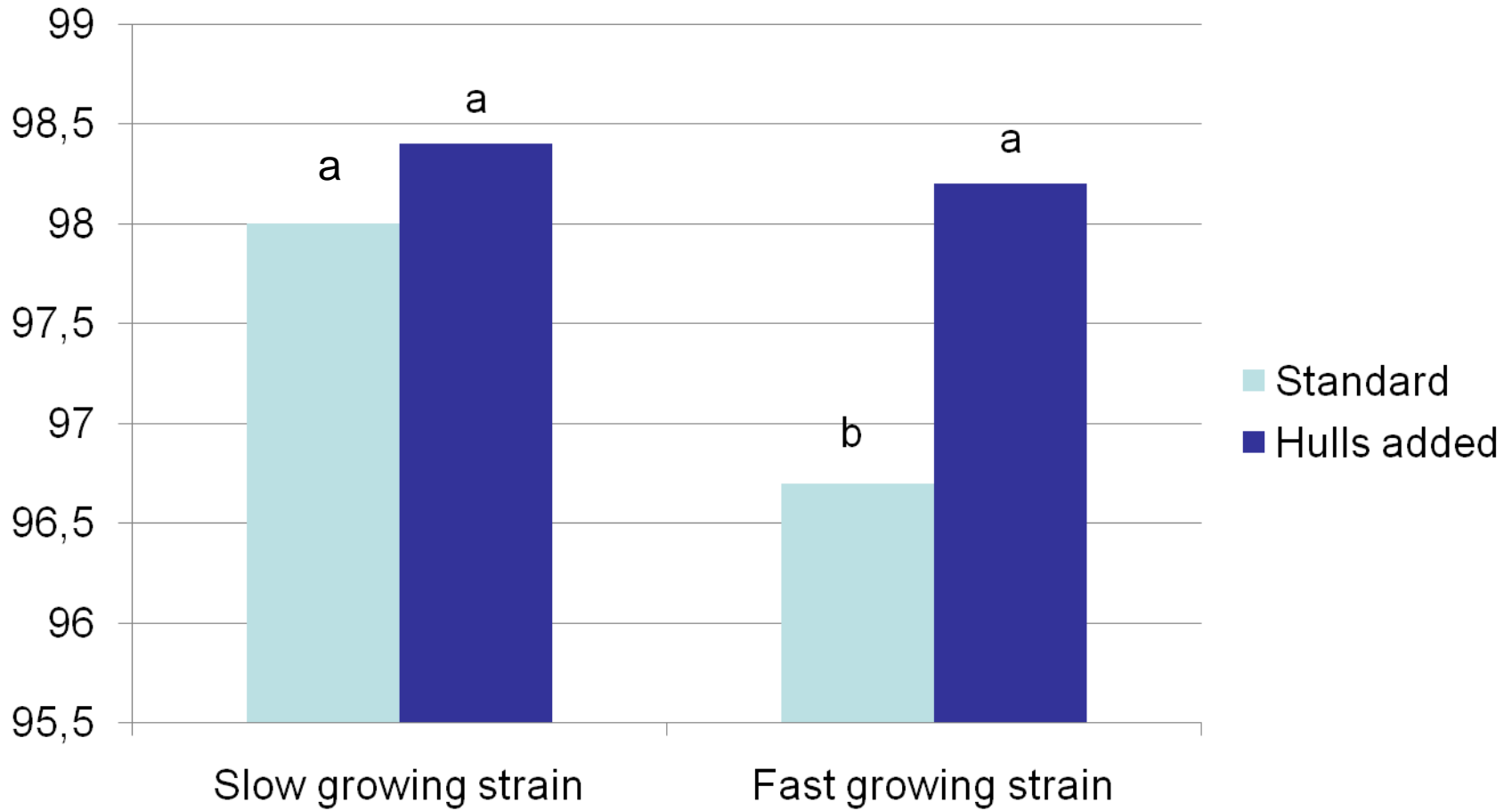
Compared with broilers selected for slow growth (O'Sullivan et al. (1992) Poultry Science 71, 610)

# Apparent metabolizable energy (kcal/kg) for different broiler breeds (Carre et al., 2008 WPSJ 64, 377 )

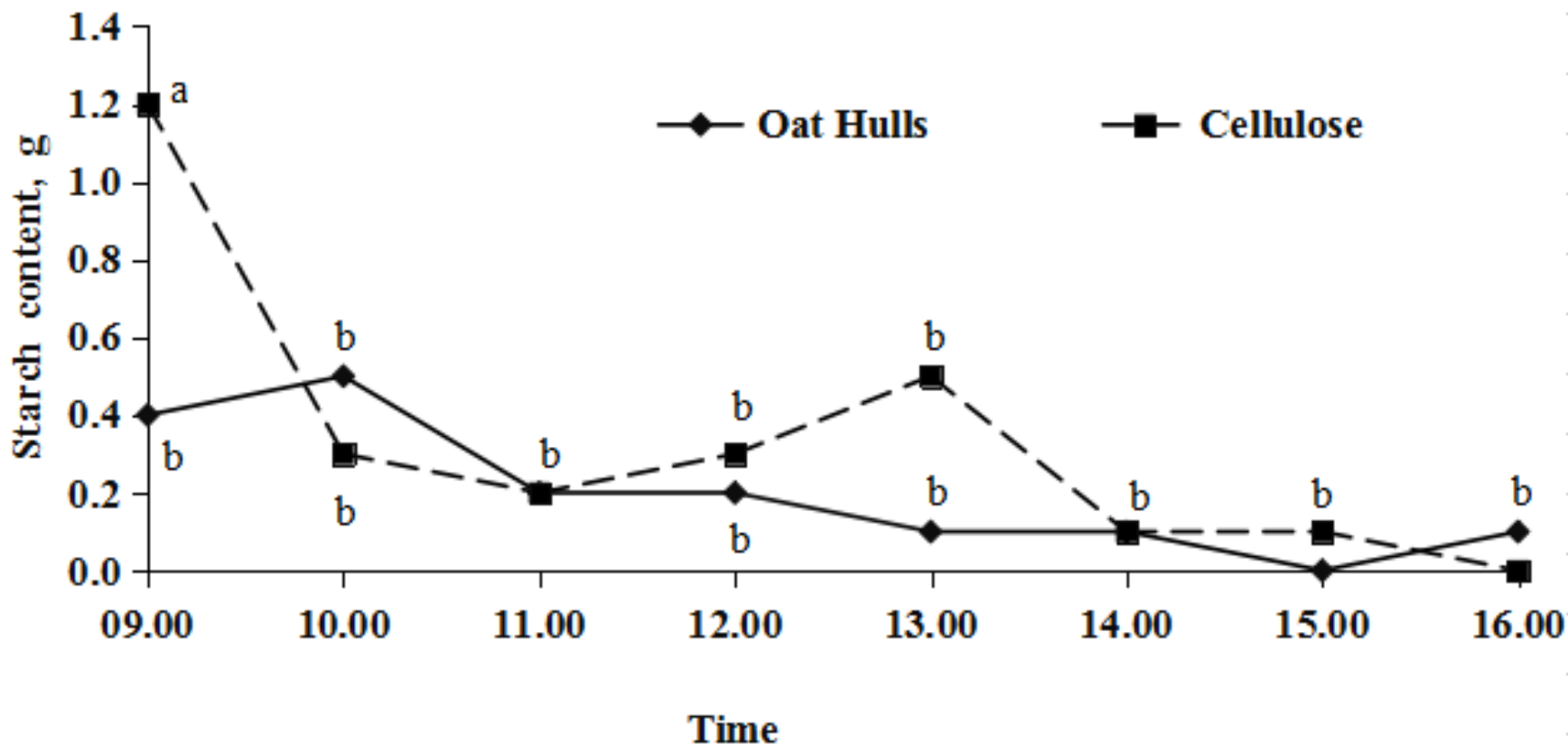


# Faecal starch digestibility of maize diets fed to two different strains of broilers

(Rougiere et al. 2009. Poultry Science 88, 1206)



# Starch in ileum of 34 d old broiler chickens<sup>1</sup> starved for 16 h and then fed from 08:00 to 09:00

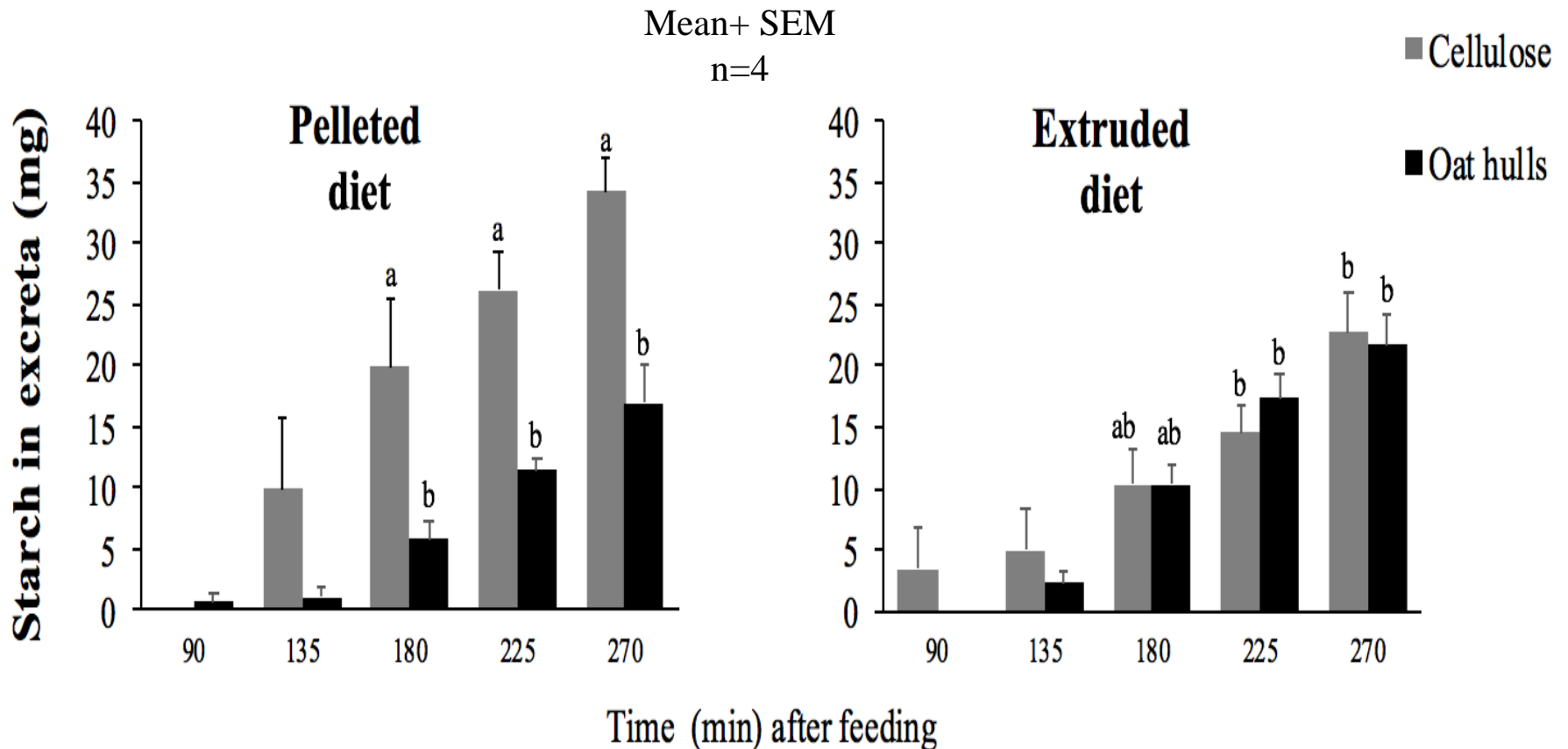


Sacranie et al. (2017). *British Poultry Science* 58, 442.

<sup>1</sup>Raised on diets with 5 % of either coarse oat hulls or cellulose powder



# Amount of starch passing through the digestive tract of broilers depending on fibre content and processing



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- **Is nutrient metabolism a limitation?**