60th Annual meeting of the European Association for Animal Production
Barcelona, Spain, 24 to 27 of August 2009

S.47 – 5244 – "Feed additives to improve diet utilization"

Flavours affect feed reward in lambs and ewes fed canola meal

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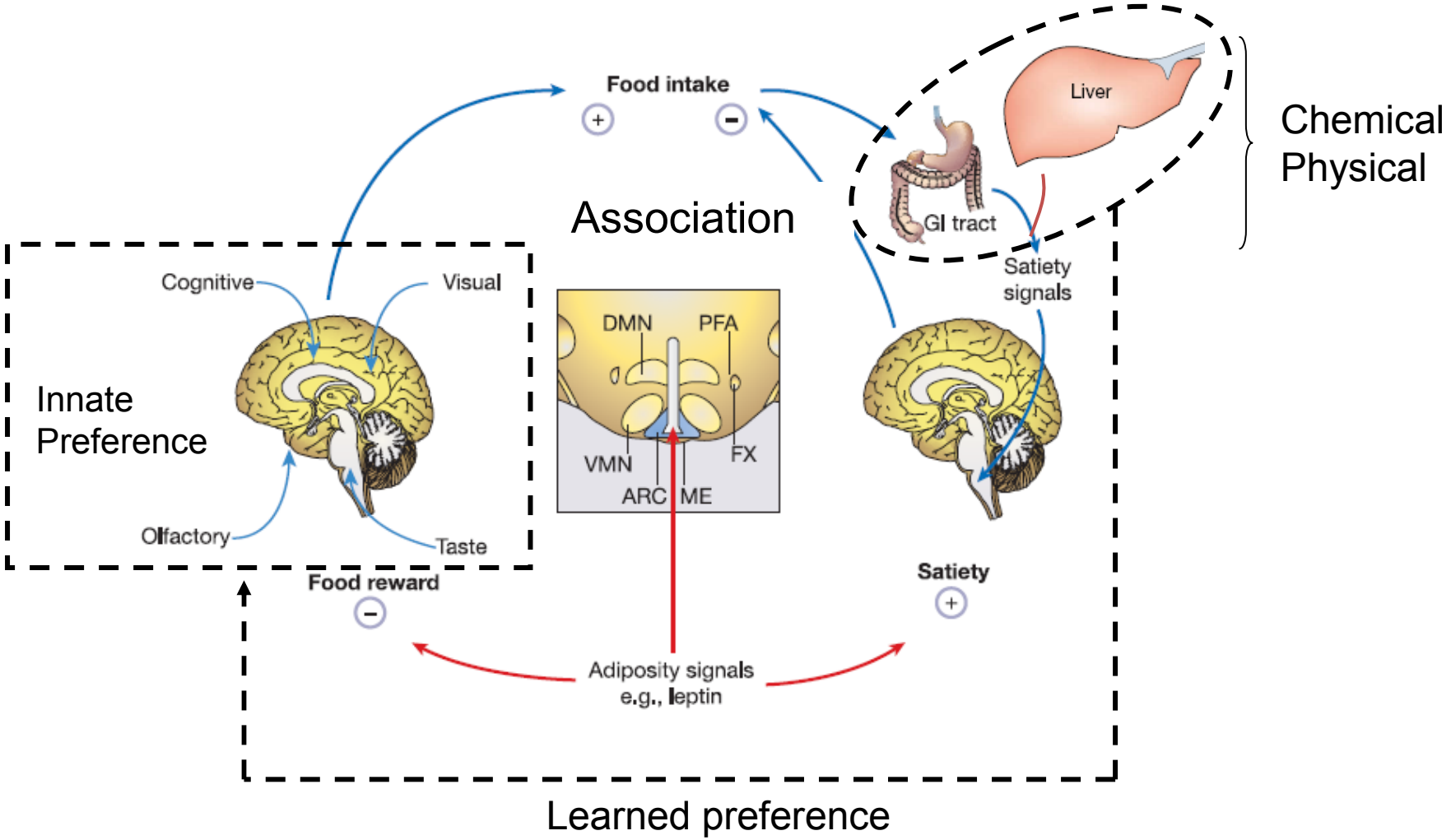
OUTLINE

- Role of sensorial perception on feed intake regulation
- Previous experiment – feed palatability
- Effect of flavours on acceptability of canola meal

Sensorial perception and feed intake regulation

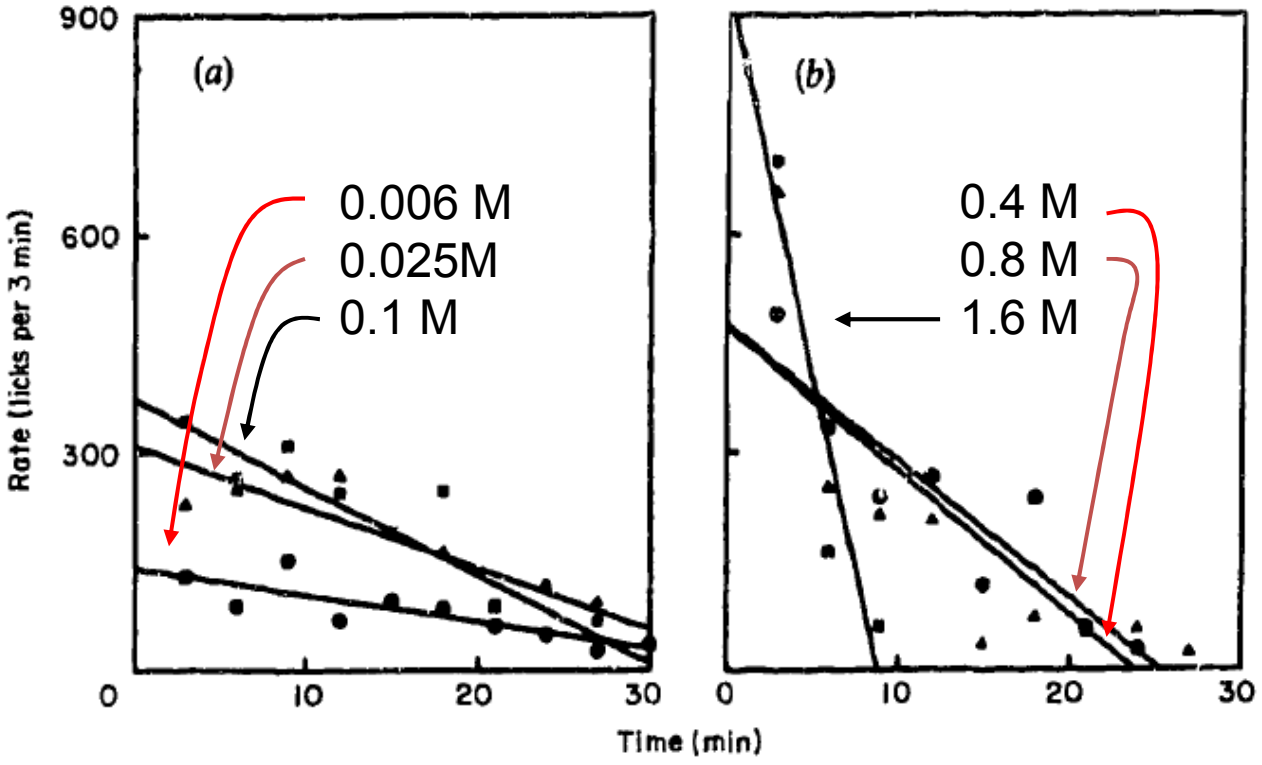
Intake & Preference Control Models



Morton et al., 2006; Forbes, 2007; Villalba and Provenza , 2007

Short term control

Rate of eating (licks/3 min) of maltose solutions (mice)



Davis and Smith, 1988

Long term control

Effect of flavored water

21-wk trial, 24-doa, 58-kg calves

1) Unflavored control water

2) Orange-flavored water

3) Vanilla-flavored water

	Water flavor			
Measure	Control	Orange	Vanilla	SE
Water intake (L/d)	1.09	1.00	0.92	0.12
Feed intake (kg/d)	0.490[a]	0.739[c]	0.522[b]	0.06
Fecal score[1]	1.22	1.19	1.35	0.09
Weight gain (kg/d)	0.82[a]	1.18[b]	0.74[a]	0.08
Time feeding (min/d)	23.12	25.21	21.33	2.49
Time drinking (min/d)	15.68	14.34	12.93	0.84

[a–c]Data within the same row having different superscripts are significantly different from each other ($P < 0.05$).

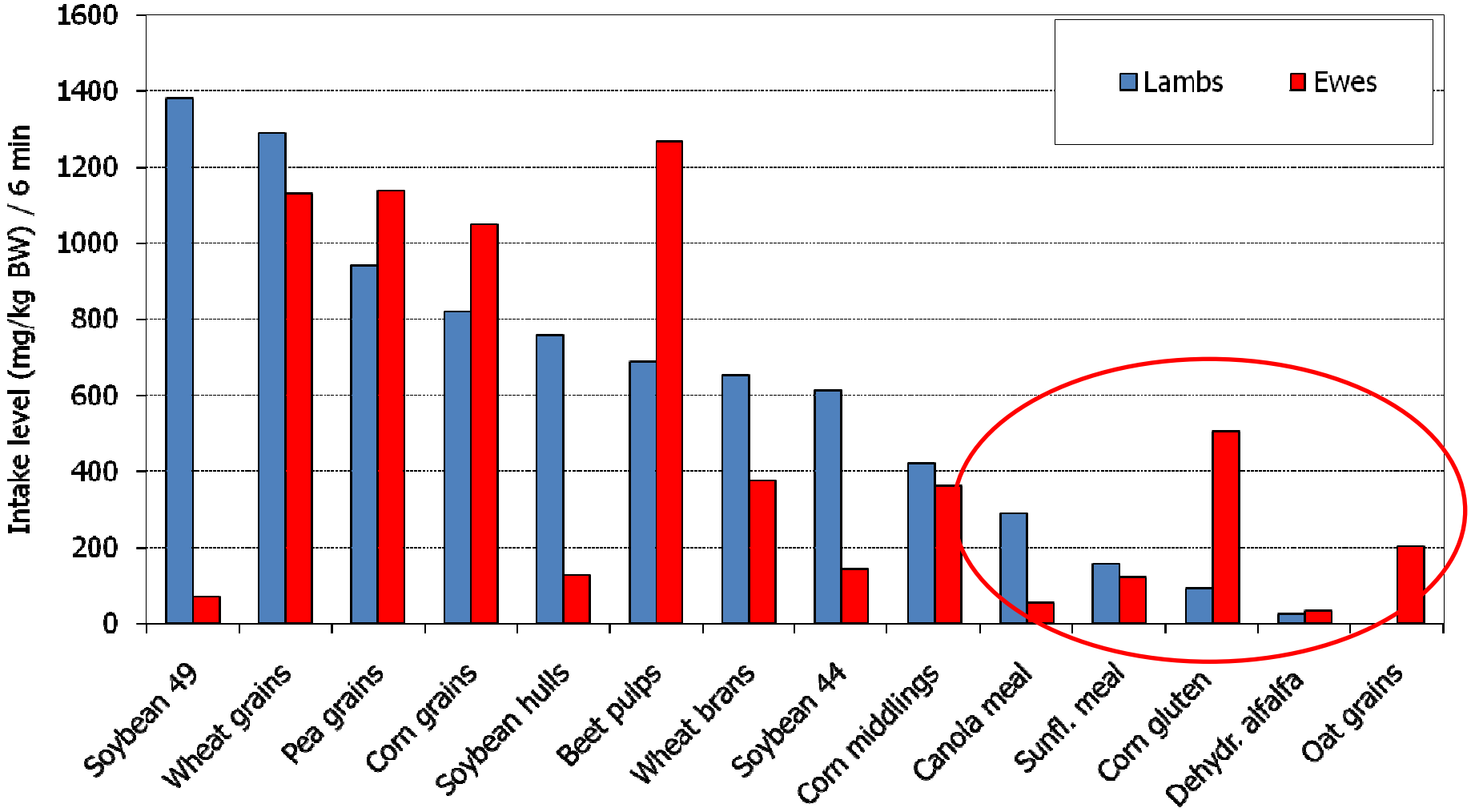
Thomas et al., 2007

Palatability in sheep

(Mereu et al., 2009)

Previous experiment: palatability of feeds

6-min palatability tests on 14 different raw materials (mostly concentrates)



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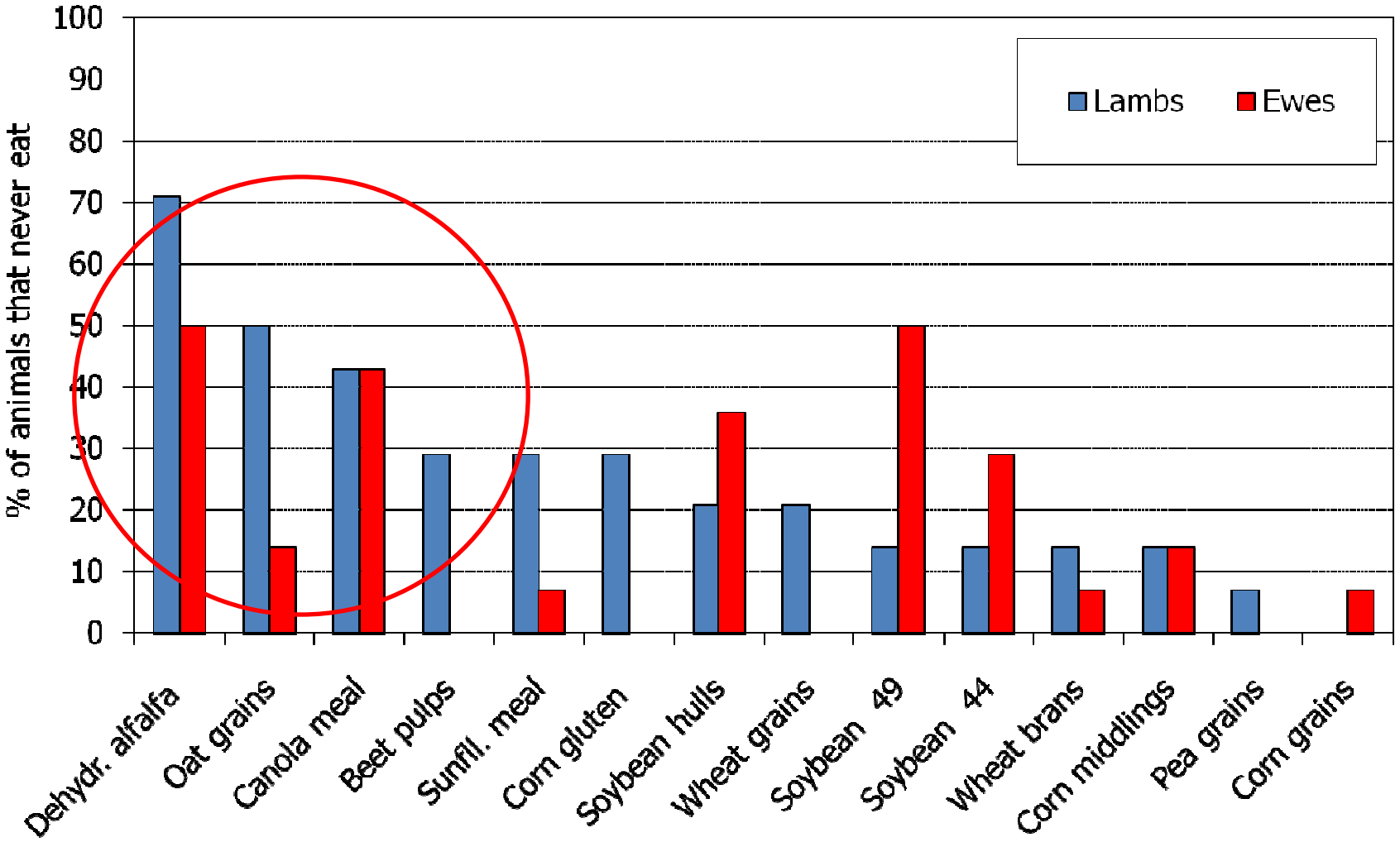


Effect of flavours on acceptability of canola meal

Objective

to enhance the acceptability of unpalatable feeds by altering their oronasal-sensorial profile through the addition of flavours

Materials and methods

Animals

- **14 female "Sarda" lambs**

- BW: 21.0 ± 2.3 kg.

- Age: 135 ± 9 days

- Days after weaning: 95 ± 8 days

- **14 multiparous dry "Sarda" ewes**

- BW: 49.6 ± 4.2 kg -

- Age: 4 ± 1 year

- BCS: 3.0 ± 0.2

Materials and methods

- **Training period** (9 d): 6 min palatability tests with barley meal
- **Experimental period** (14 d): 6 min palatability test with canola meal + flavours
- **Experimental design**: 14x14 Latin square (14 treatments)

- **Basal diet**: ryegrass hay and barley meal+urea
- **Daily routine**:
- **7.00**: Collection of feed refusals of basal diet
- **8.00**: Beginning of palatability tests
- **12.00** and **17.00**: Supply of the basal diet

Material and Methods: **Training period (9 days)**

Animals were adapted to the "*palatability test*"

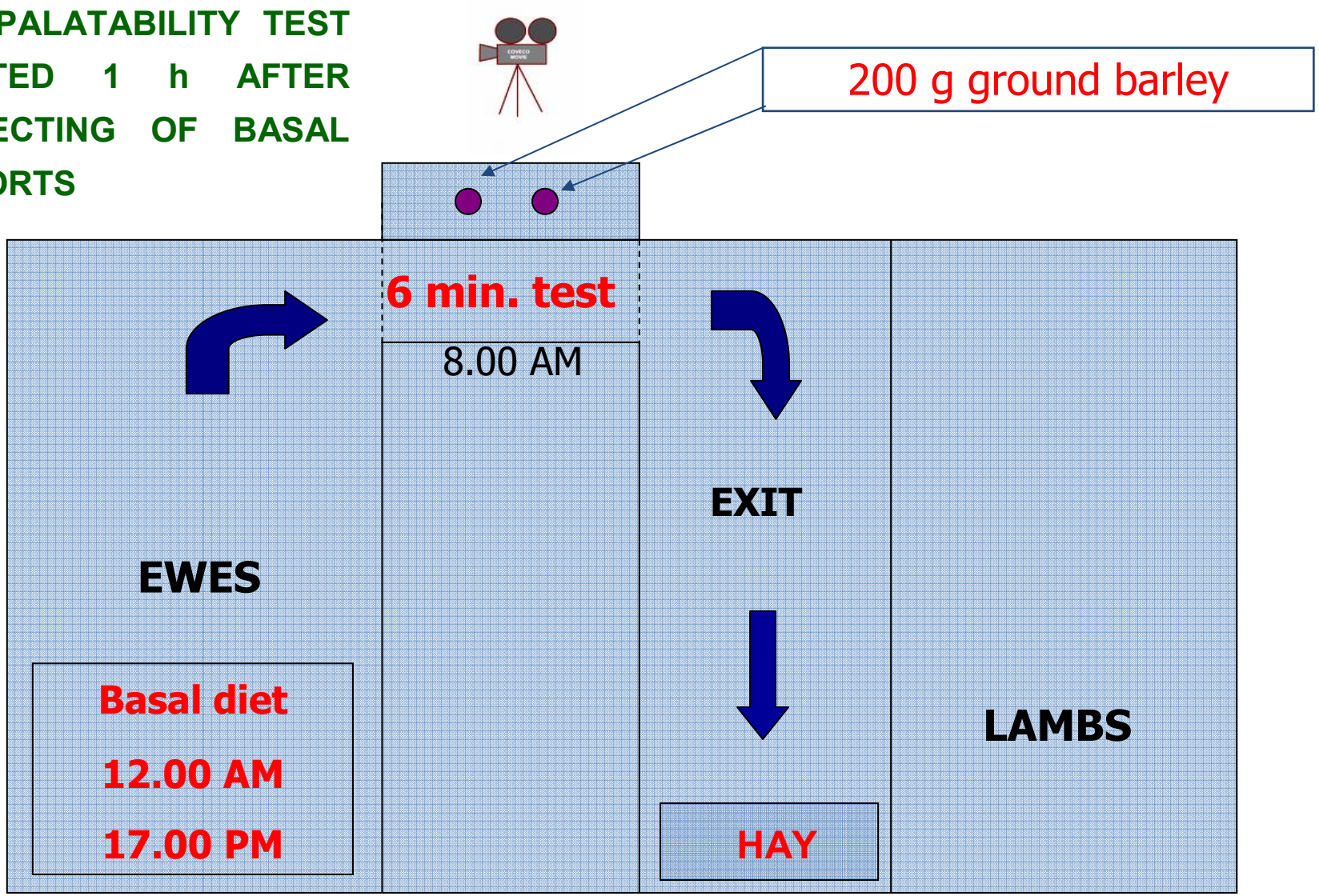
1) to **voluntarily** enter an **individual pen** with a manger containing two steel bowls with **100 g of barley meal** each

2) to stay there for **6 minutes** for the palatability test

3) to leave the pen and go to an **adjacent collective pen** at the end of the palatability test. In that pen the animals received **ryegrass hay ad libitum**

M & M - Palatability tests

THE PALATABILITY TEST STARTED 1 h AFTER COLLECTING OF BASAL DIET ORTS



Material and Methods

Sweet flavours

1 Sweet taste product with stevia, licorice and fenugreek notes.
2 Sweet taste product with licorice and fenugreek notes.
3 Sweet flavour and taste with anisic and toasted notes of licorice.
4 Sweet flavour and taste characteristic of natural sugar beet molasses.
5 Sweet flavour and taste with pleasant orange note characteristic of juice.
6 Sweet flavour and taste with pleasant apple note.
7 Sweet flavour and taste with pleasant creamy coconut and vanilla bottom.
8 Saccharine free sweetener nucleus.

Umami and other flavours

9 Savoury taste product.
10 Fresh onion flavour with a savoury fraction.
11 Pleasant combination of cereals notes with slight toasted character.
12 Combination of fatty and roasted notes characteristic of argan oil.
13 Herbal flavour with bitter alfalfa note.

Material and Methods: statistical analysis

General Linear Model applied to a Latin square design

$$Y = \mu + \alpha i + \beta j + \gamma i + \varepsilon ijk$$

μ = mean

αi = fixed effect of feed

βj = fixed effect of animal

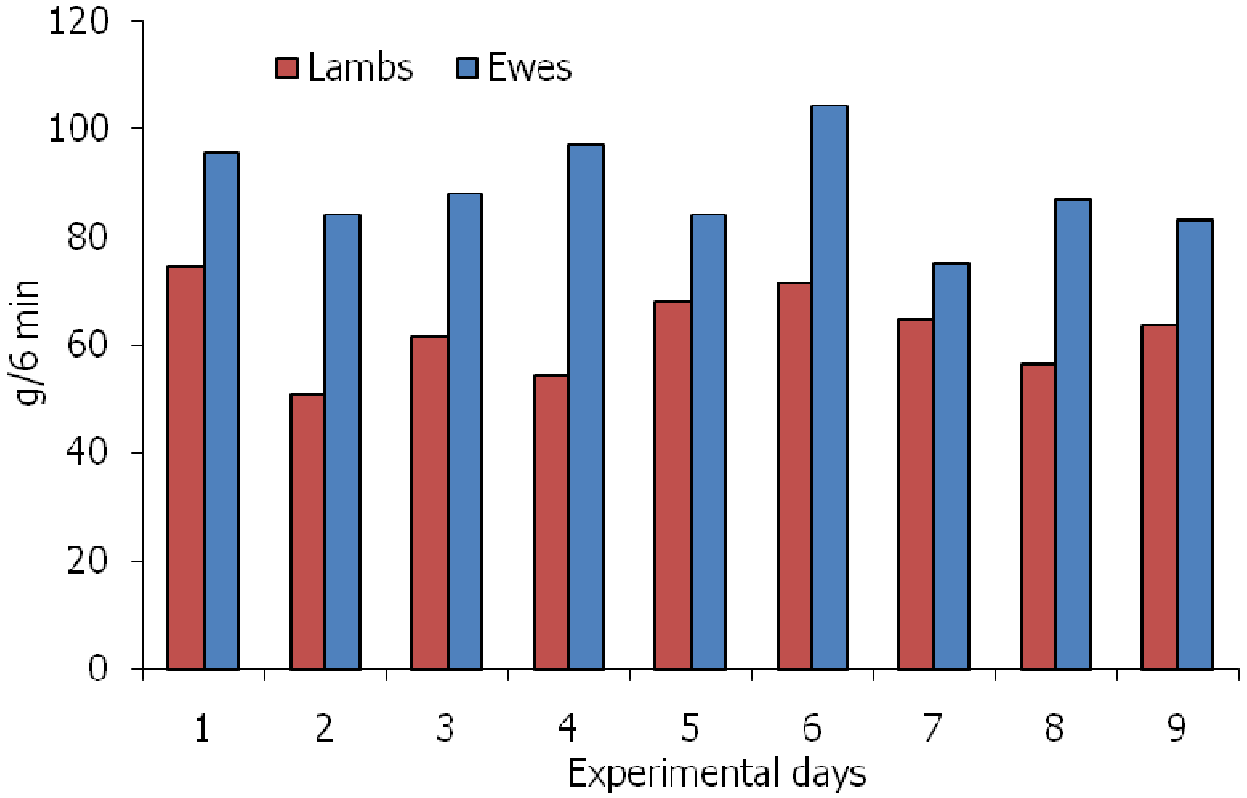
γi = fixed effect of time

εijk = random error

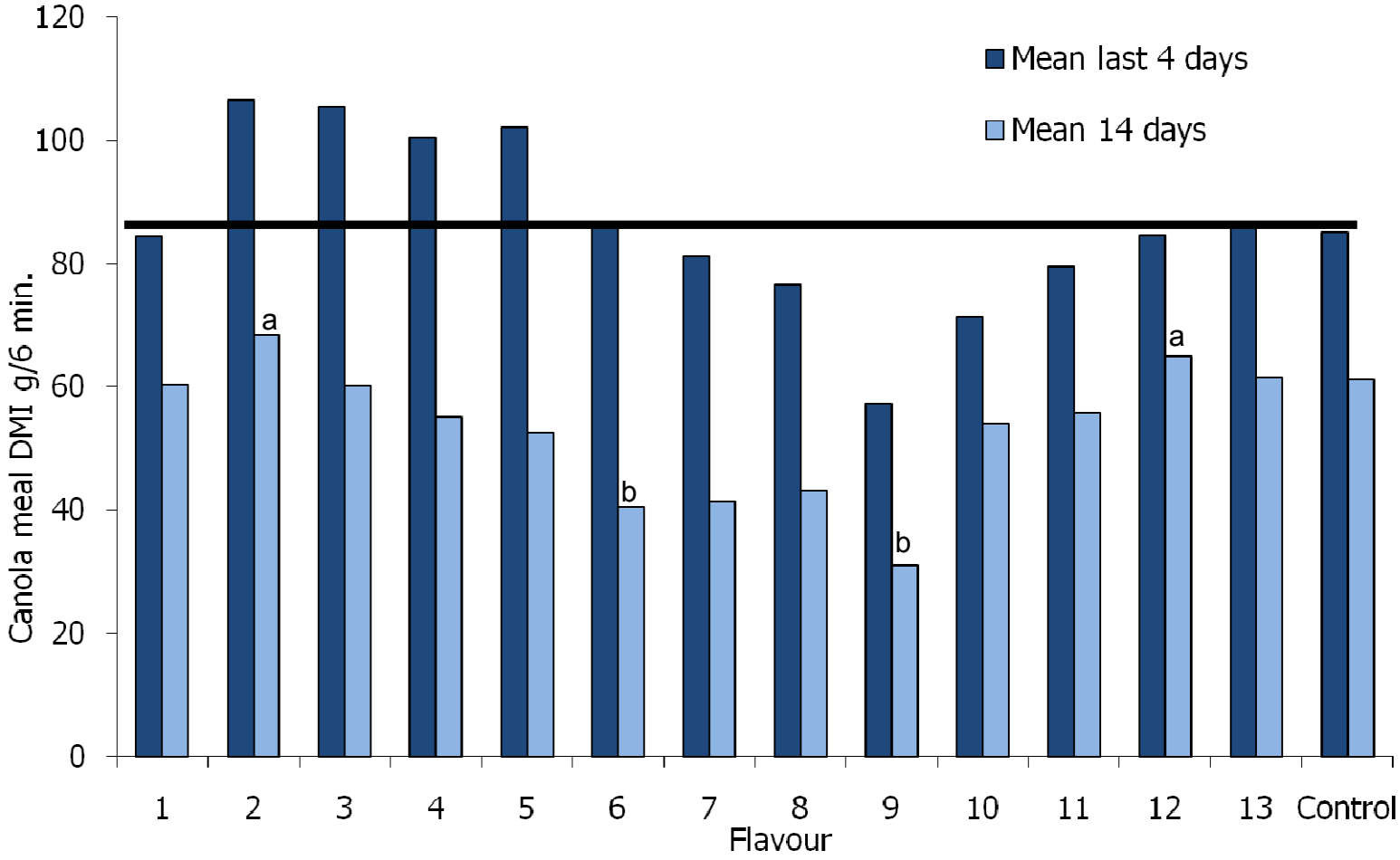
Tukey $P < 0.05$

Results

Intake of barley meal during the training period



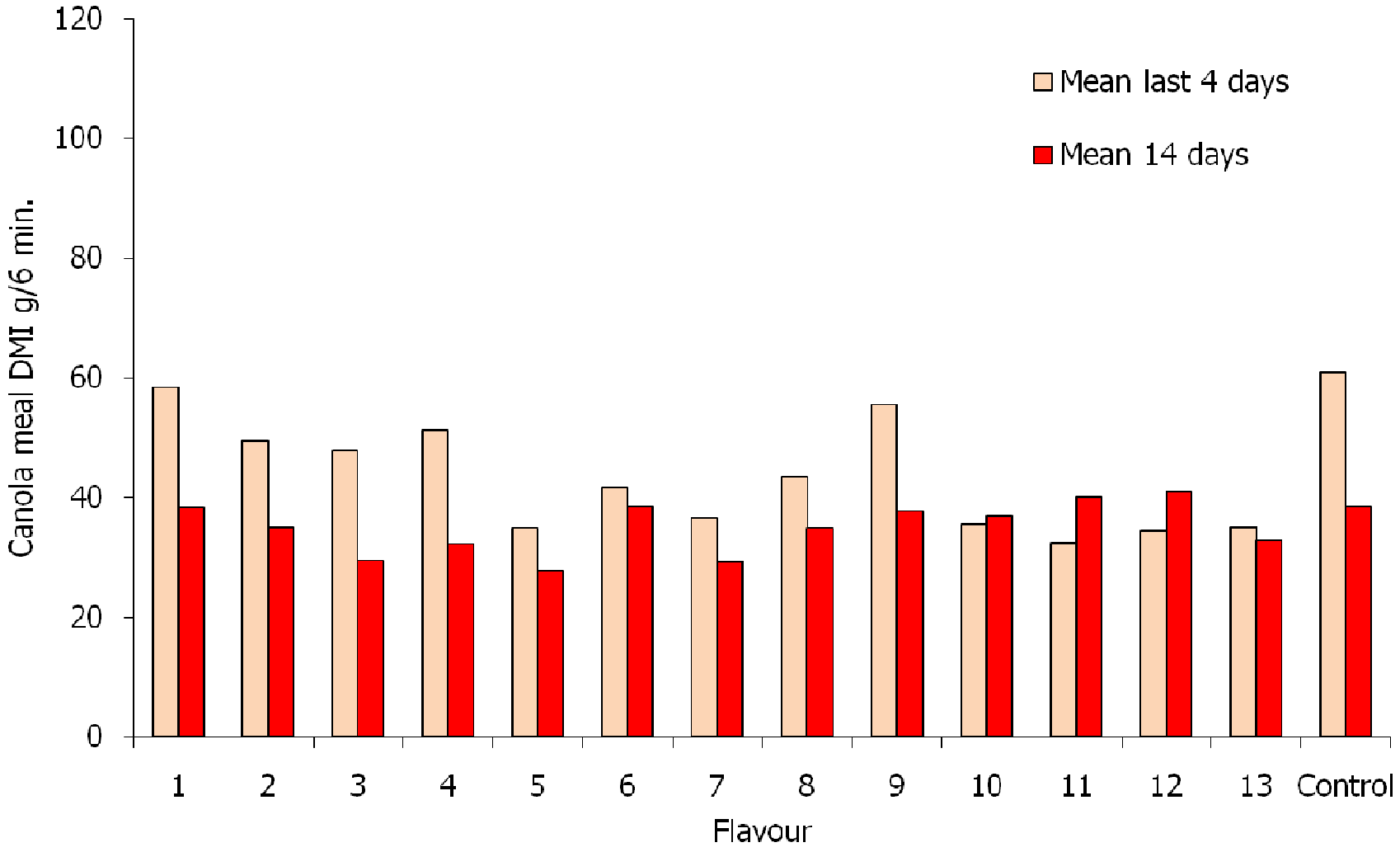
Results: DMI by **ewes**



Treatment effect: P<0.001

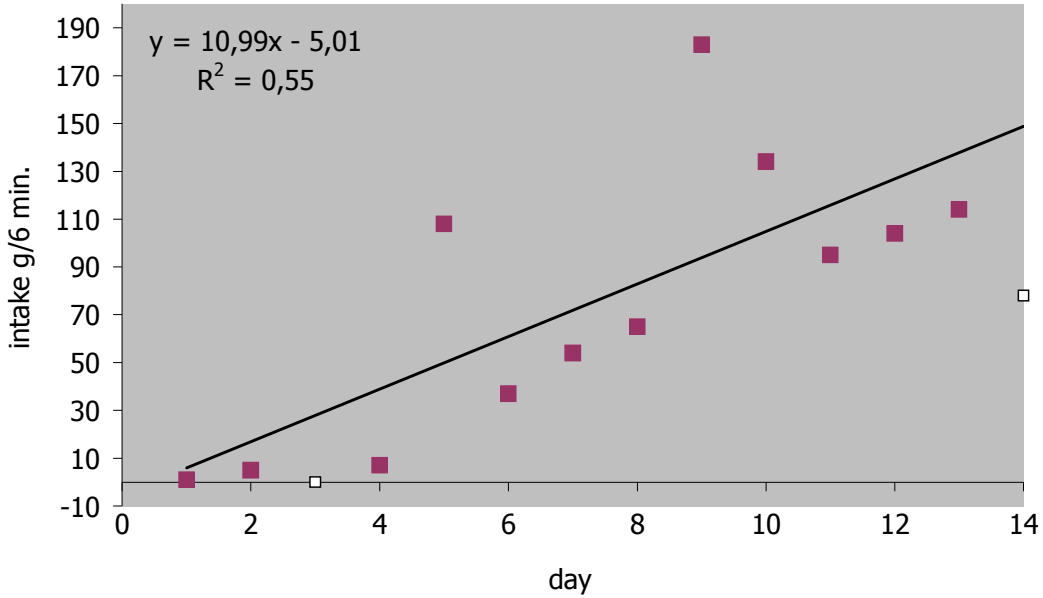
a, b P<0.05

Results: DMI by **lambs**

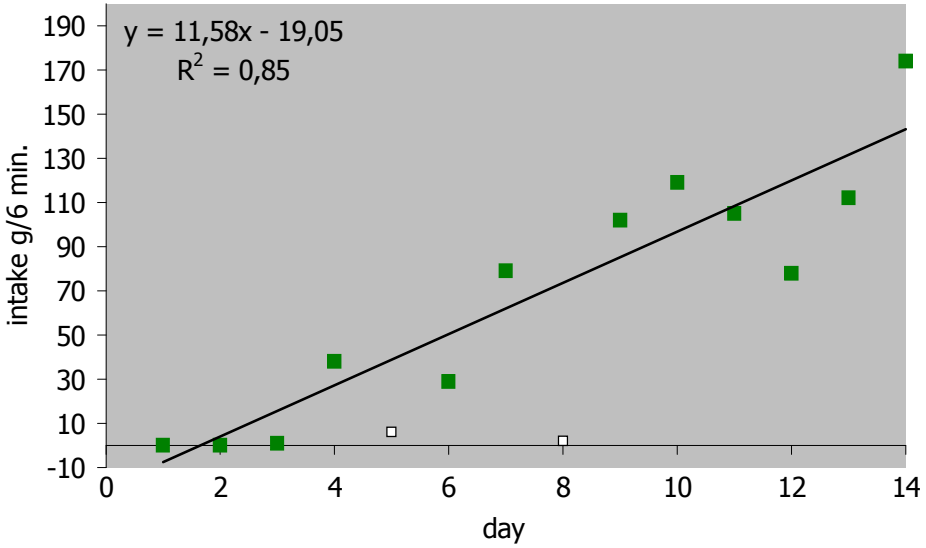


Treatment effect: P > 0.1

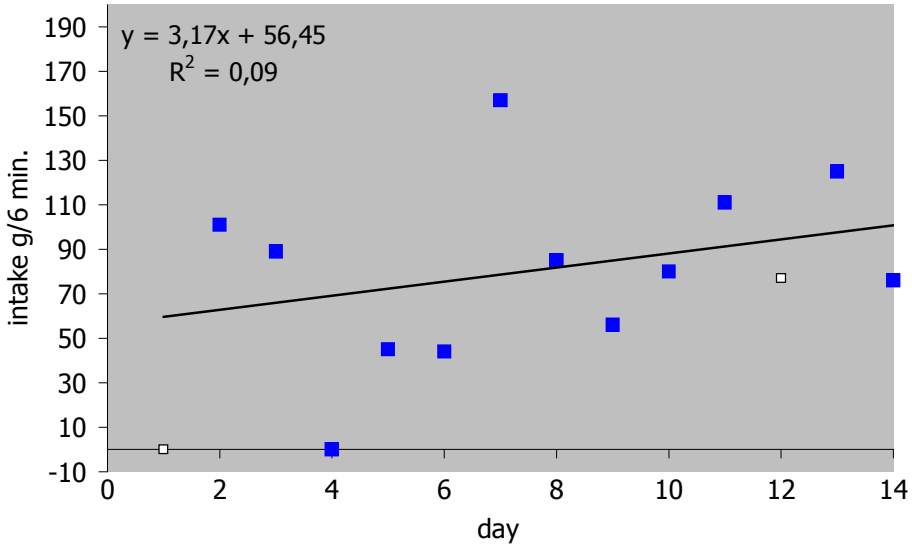
Results: **EWES**



Canola meal only (DMI = 61.3 g)



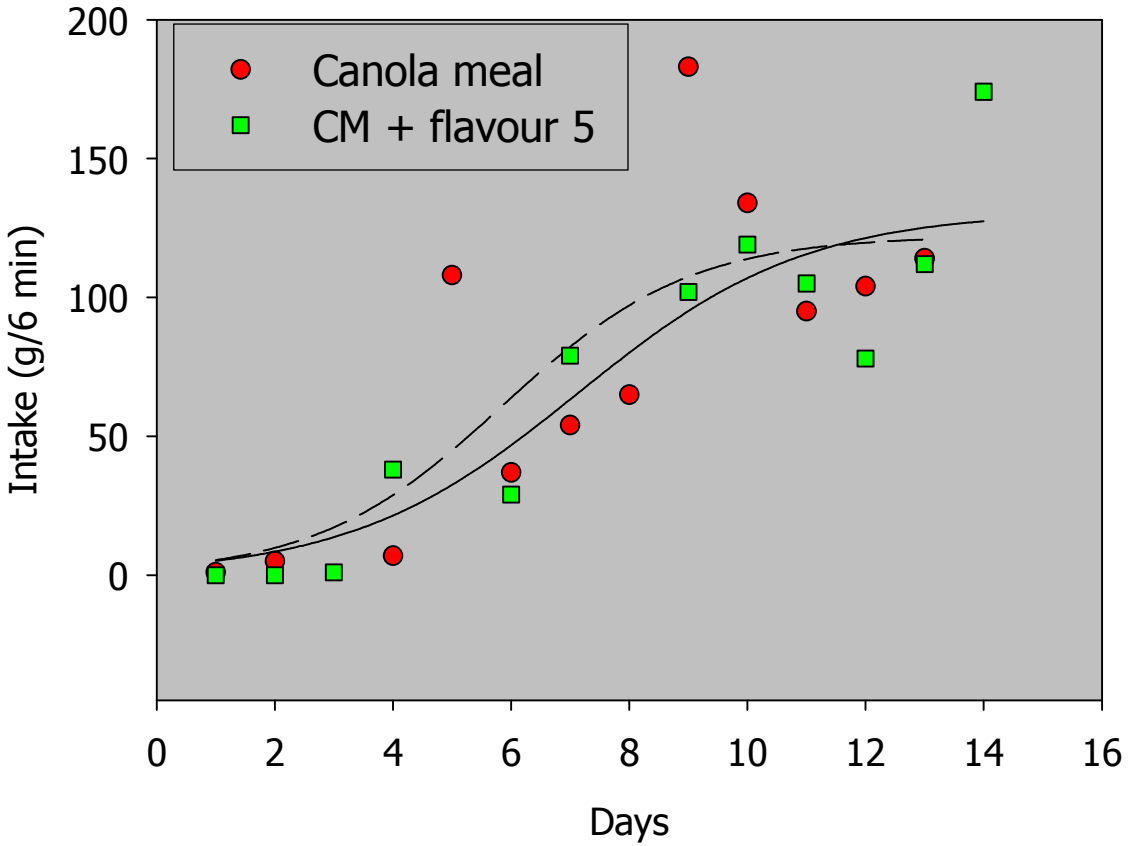
CM+ flavour 5 (DMI = 52.6 g)



CM+ flavour 12 (DMI = 65.1 g)

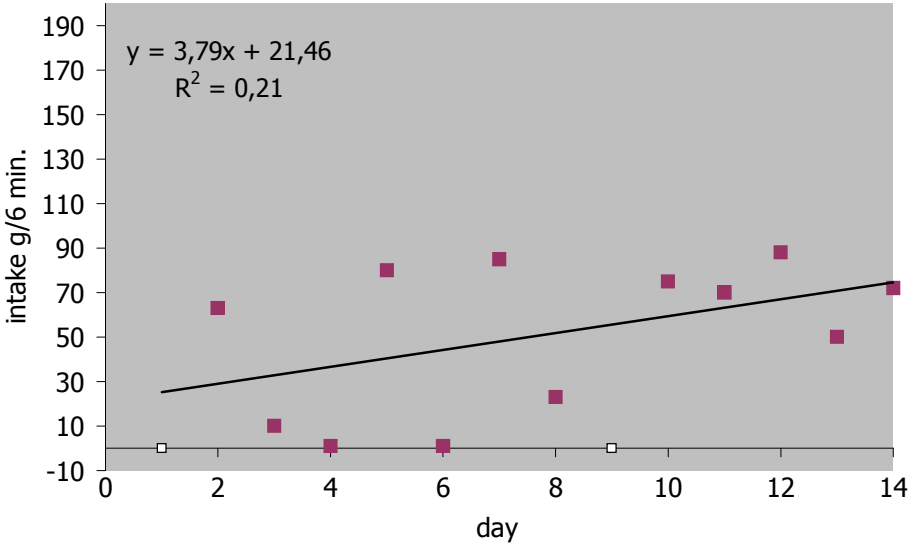
Results

Ewes fed canola meal or canola meal with **flavour n. 5**

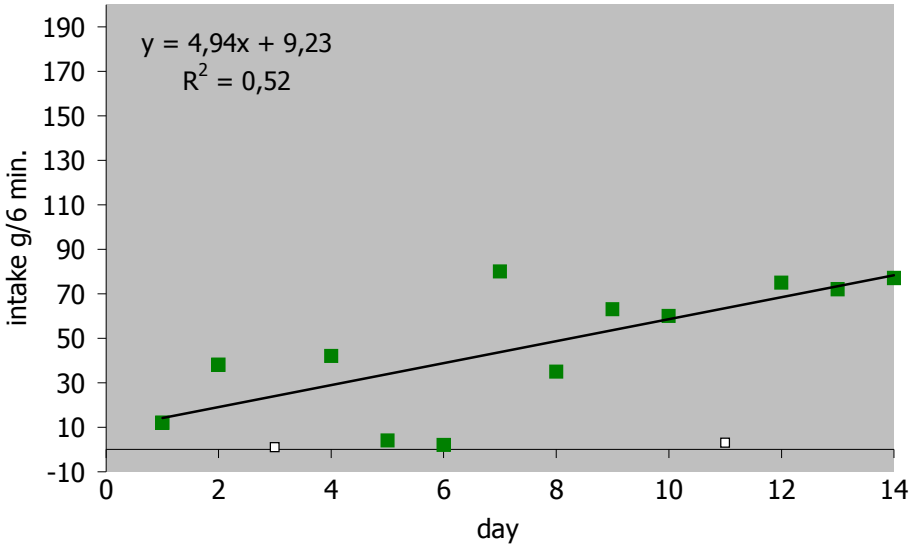


	Control	Flavor
Rate (%)	100	108
R^2	.62	.84

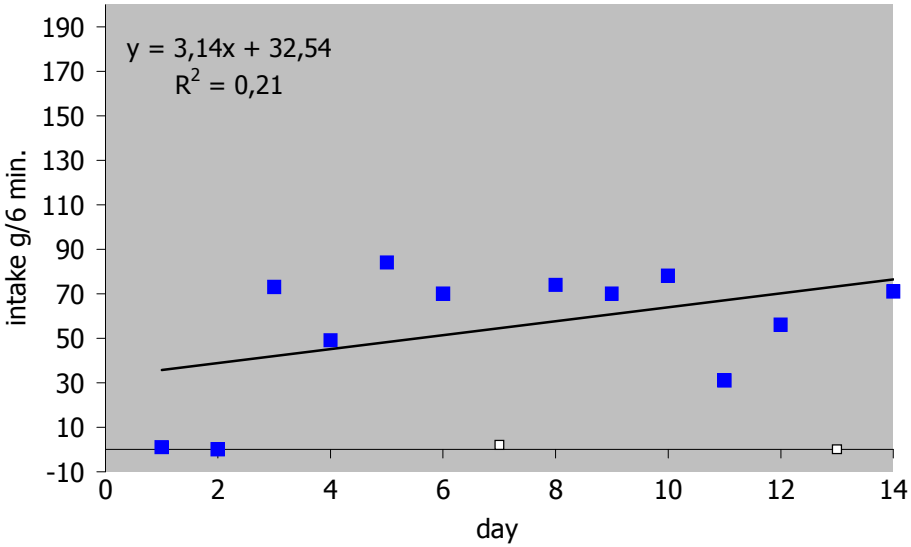
Results: **LAMBS**



Canola meal only (DMI = 38.6 g)



CM+ flavour 2 (DMI = 35.1 g)



CM+ flavour 12 (DMI = 41.1 g)

Conclusions

Both for lambs and ewes, the DMI in the 6 min test increased as the experiment progressed

- The animal can adapt to consume an initially unpalatable feed if given time to do so

- **Ewes:** **DMI** during the last 4 days for **treatments 2, 3, 4, and 5 was higher (up to 40%) than that of the unflavoured canola meal** and of the other treatments

- **Lambs**: not clear effect of flavours; lack of experience?

Conclusions

- Addition of some flavours (**mostly sweet based**), increases the homogeneity of the behavioural response.

Lambs: $r^2_{\text{treatment 2}} = 0.52$ vs $r^2_{\text{control}} = 0.21$

Ewes: $r^2_{\text{treatment 5}} = 0.85$ vs $r^2_{\text{control}} = 0.55$

Representing respectively a 148% and 54% reduction in unexplained variation

Conclusions

Flavour 12

- Highest numerical DMI both in **lambs** (41.1 g) and **ewes** (65.1 g),
- A response that appeared innate and non-adaptive

Flavour 5

- Highest rate of DMI increase
- A response that appeared learned and adaptive

Thank you !