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Dry matter and NDF rumen degradability assessed by two *in vitro* techniques on seven feeds

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Aim

- To compare in terms of mean and variability, the measurements of DM and NDF degradability, and "*in vitro* true dry matter degradability" (IVTDMD) obtained with two techniques on different feeds

- The two techniques compared were:

- Daisy[II] (D)
- Closed Batch Culture (CBC)

Material and methods

Techniques (1)

Daisy^{II}
(D)

- A chamber with 4 glass rotating jars (3 l/jar of capacity)
- Up to 100 feed samples analyzed simultaneously
- Feed samples are introduced into individual filter bags

Techniques (2)

Closed Batch Culture (CBC)

- 50 jars (280 ml/jar of capacity)
- A single feed sample per jar
- No need filter bags
- Gas production can also be measured by a pressure detector and a wireless connection to a PC (under test)

Experimental design

- 2 trials (one for DMd and one for NDFd) for both Daisy^{II} and CBC instruments were performed.

- In each trial, 3 consecutive incubations were carried out

- In each incubation:
  - with Daisy^{II}: 7 feeds (plus a blank) x 4 jars x 3 replications (96 samples x incubation)
  - with CBC: 7 feeds (plus a blank) x 3 replications (24 samples x incubation)

were analyzed

Feeds

- Corn meal

- Soybean meal

- Sugar beet pulp

- Corn silage

- Alfalfa hay

- Grass hay

- Wheat straw

Incubation procedure

- 0.5 g of feed sample was incubated for 48 h at 39℃
- Inoculum: buffer (Menke) plus rumen fluid collected from 3 dry cows (ratio buffer:rumen fluid = 4:1)

Chemical analysis

- DM and NDF content (Van Soest *et al.*, 1988)
  (NDF values were not ash-free)

Computations

- DM and NDF degradability;

- *In vitro* true dry matter degradability (IVDMTD) (Van Soest,1970):

IVTDMD = 100* [(DM – NDFres) / DM)]

where NDFres is the residual NDF after incubation

Statistical analysis

- Data obtained with each technique were analyzed applying the following model:

$$y_{ij} = \mu + feed_i + e_{ij}$$

  Root MSE (RMSE) and coefficient of variation (CV) were used as indexes of repeatability

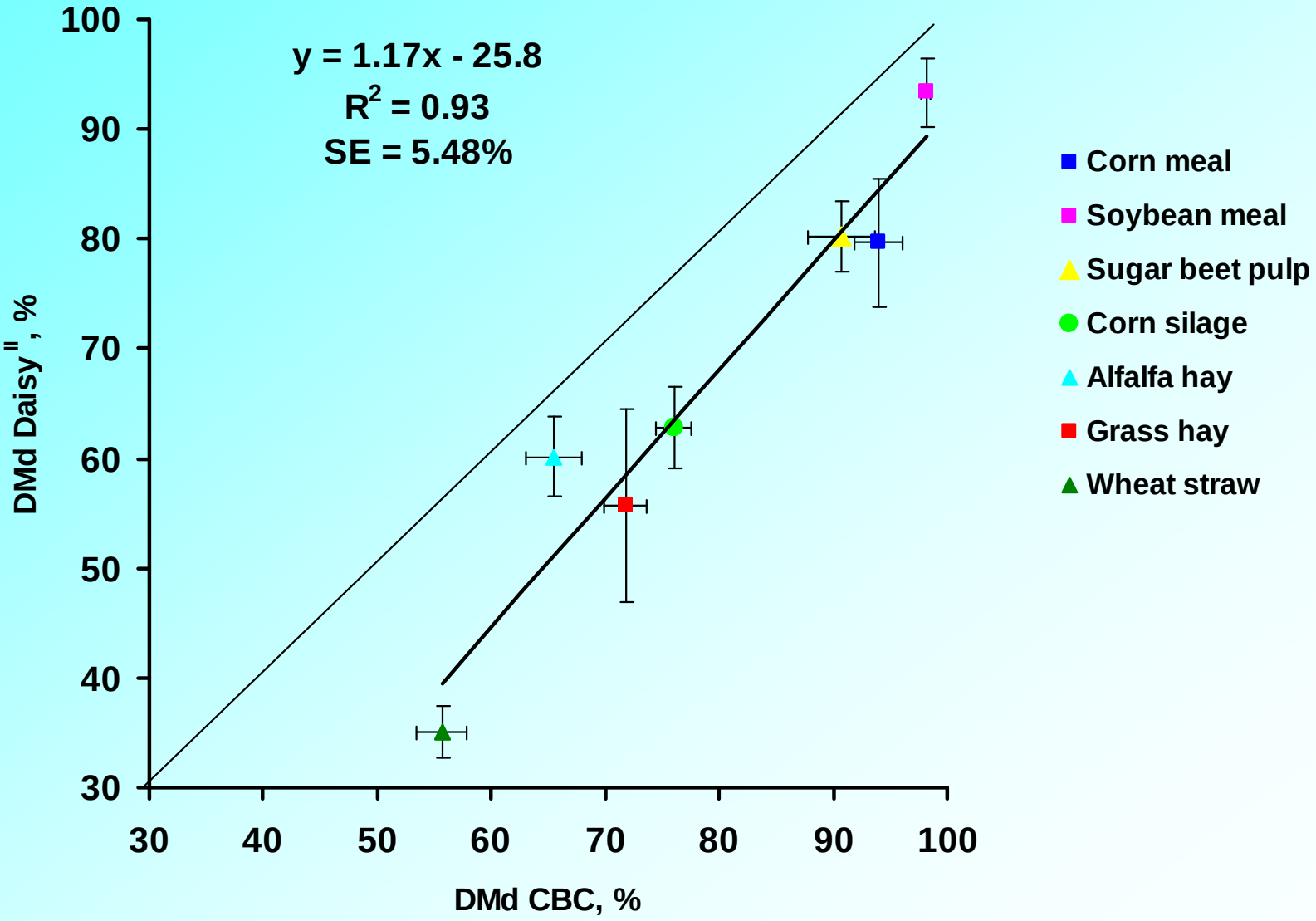
- The estimated Ls-means of degradability for each feed obtained with the two techniques were compared by regression.

- Data were also subjected to ANOVA using factorial models that considers for:
  - Daisy[II] data: feed, incubation, jar and their interactions.
  - CBC data: feed, incubation and their interaction.

Results

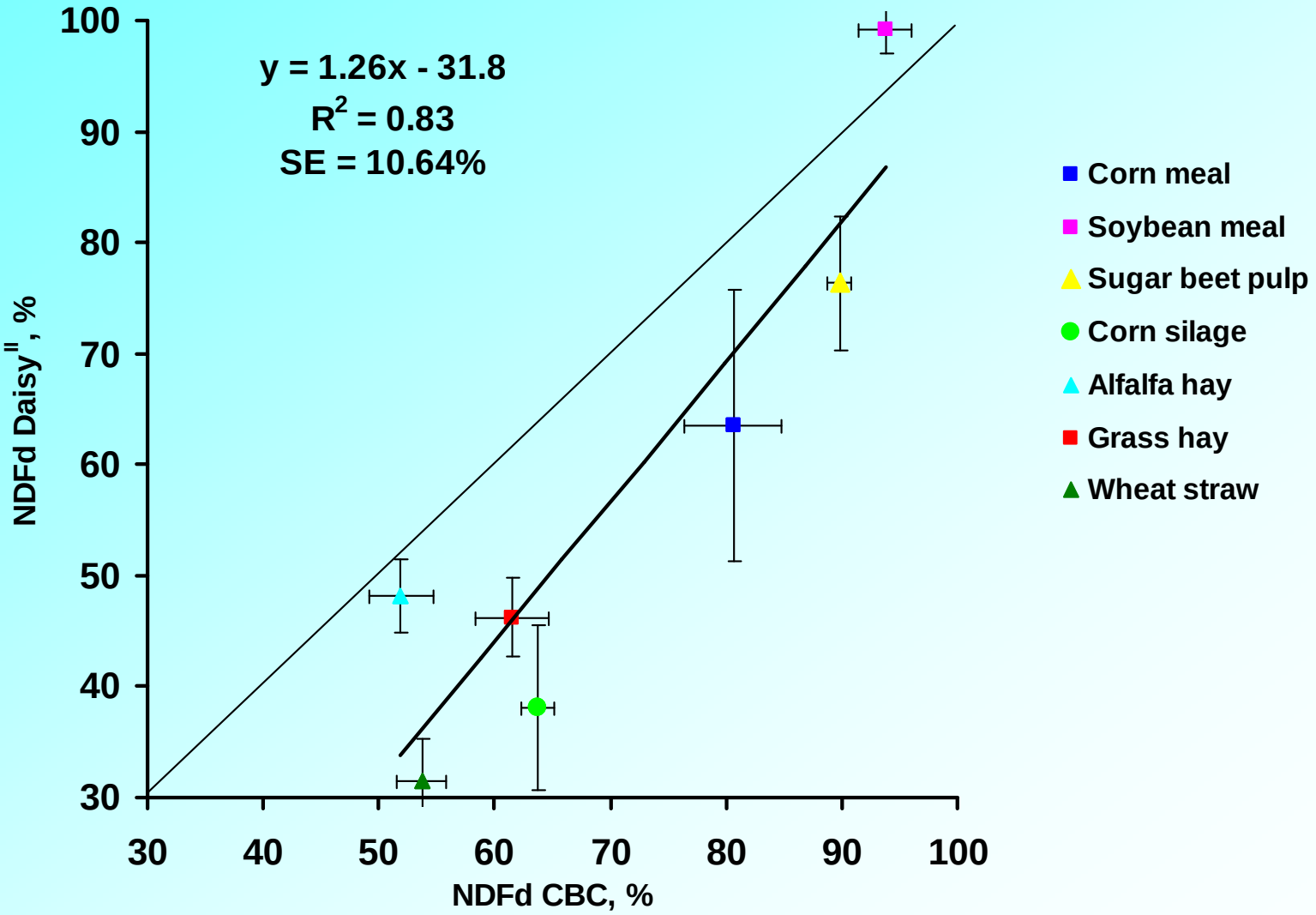
Daisy^{II} *vs.* CBC

Dry matter degradability (DMd)



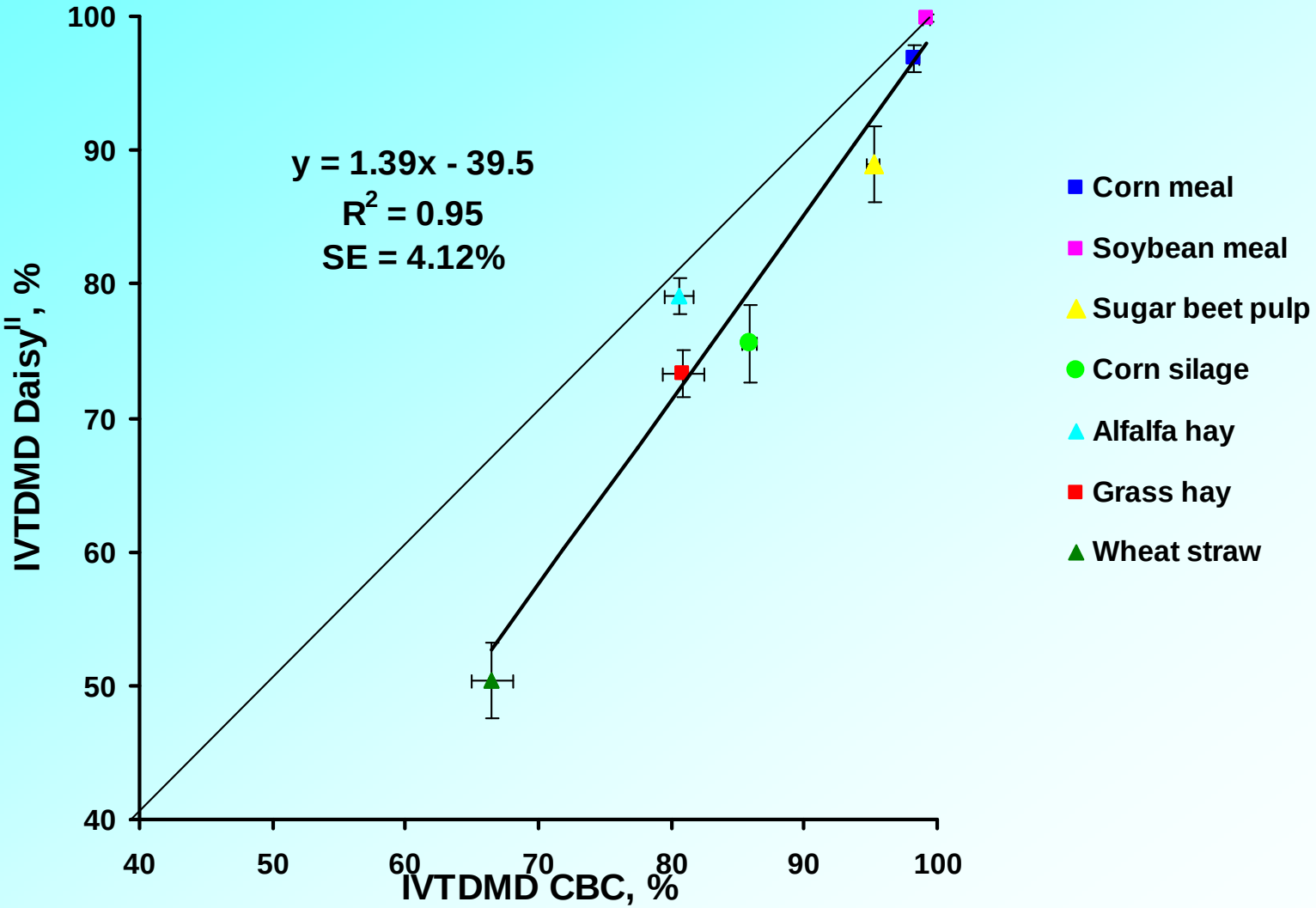
Daisy^{II} *vs.* CBC

NDF degradability (NDFd)



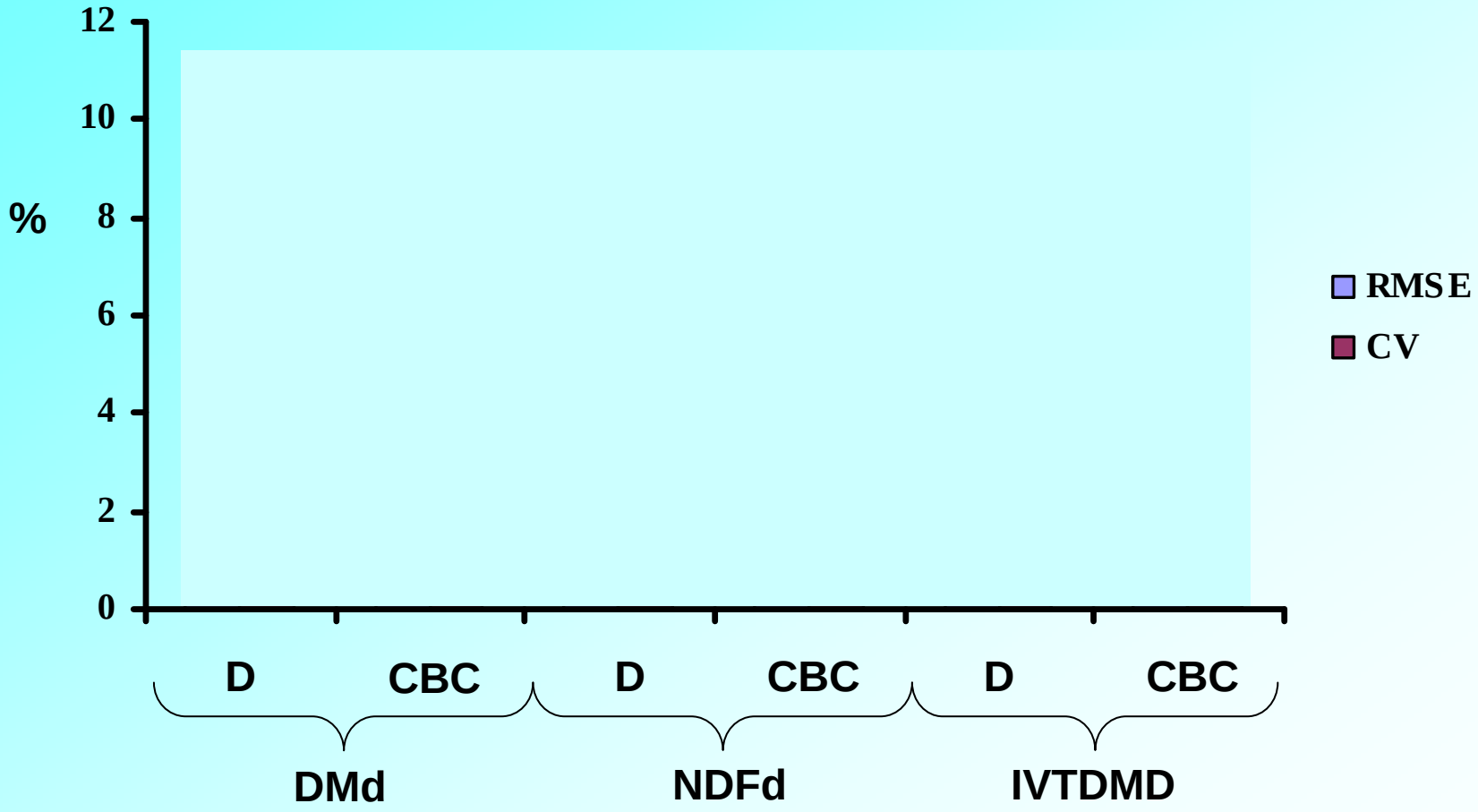
Daisy^{II} *vs.* CBC

In vitro true dry matter degradability (IVTDMD)



Daisy^{II} *vs.* CBC

Variability of the measurements

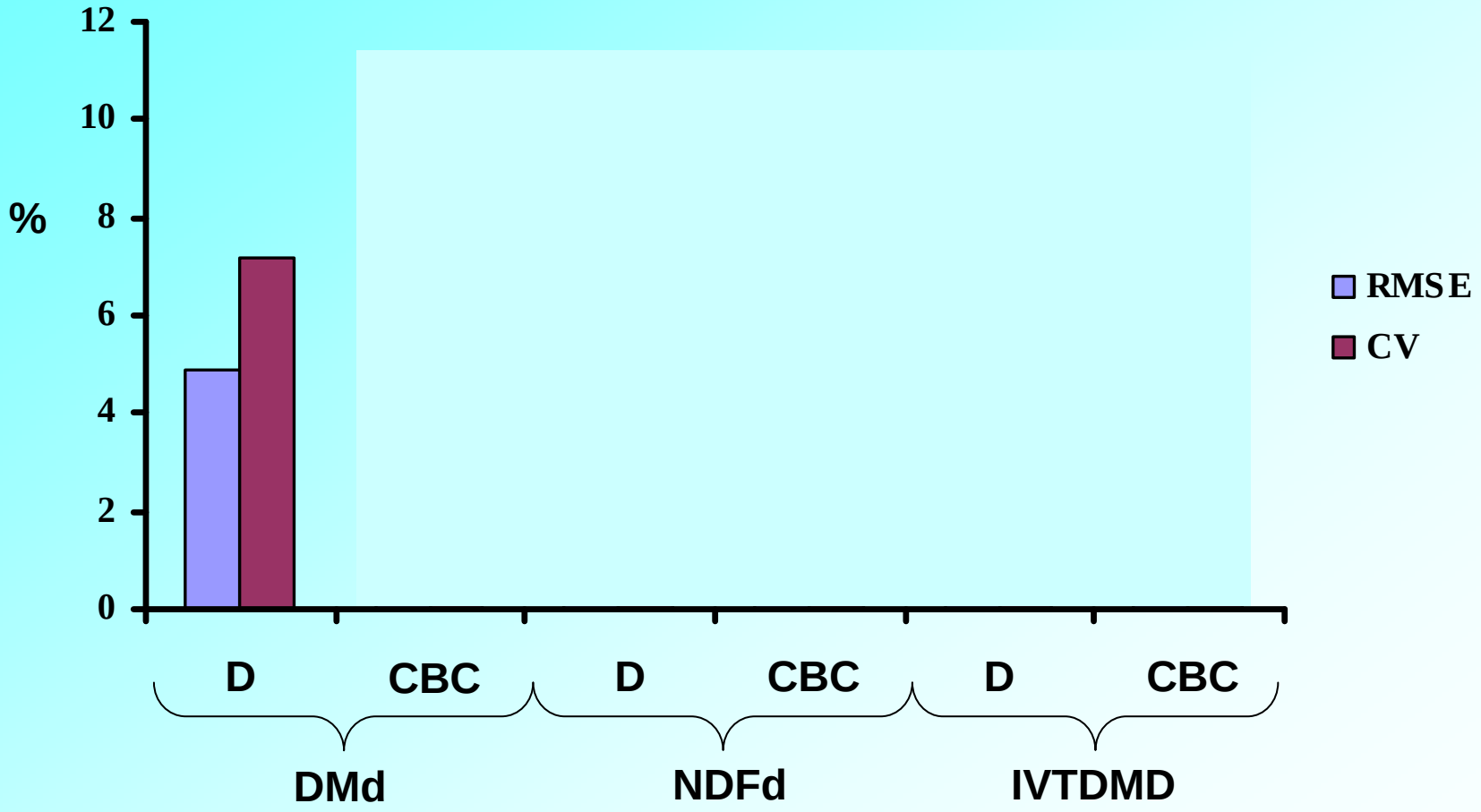


D = Daisy^{II}

CBC = Closed Batch Colture

Daisy^{II} *vs.* CBC

Variability of the measurements



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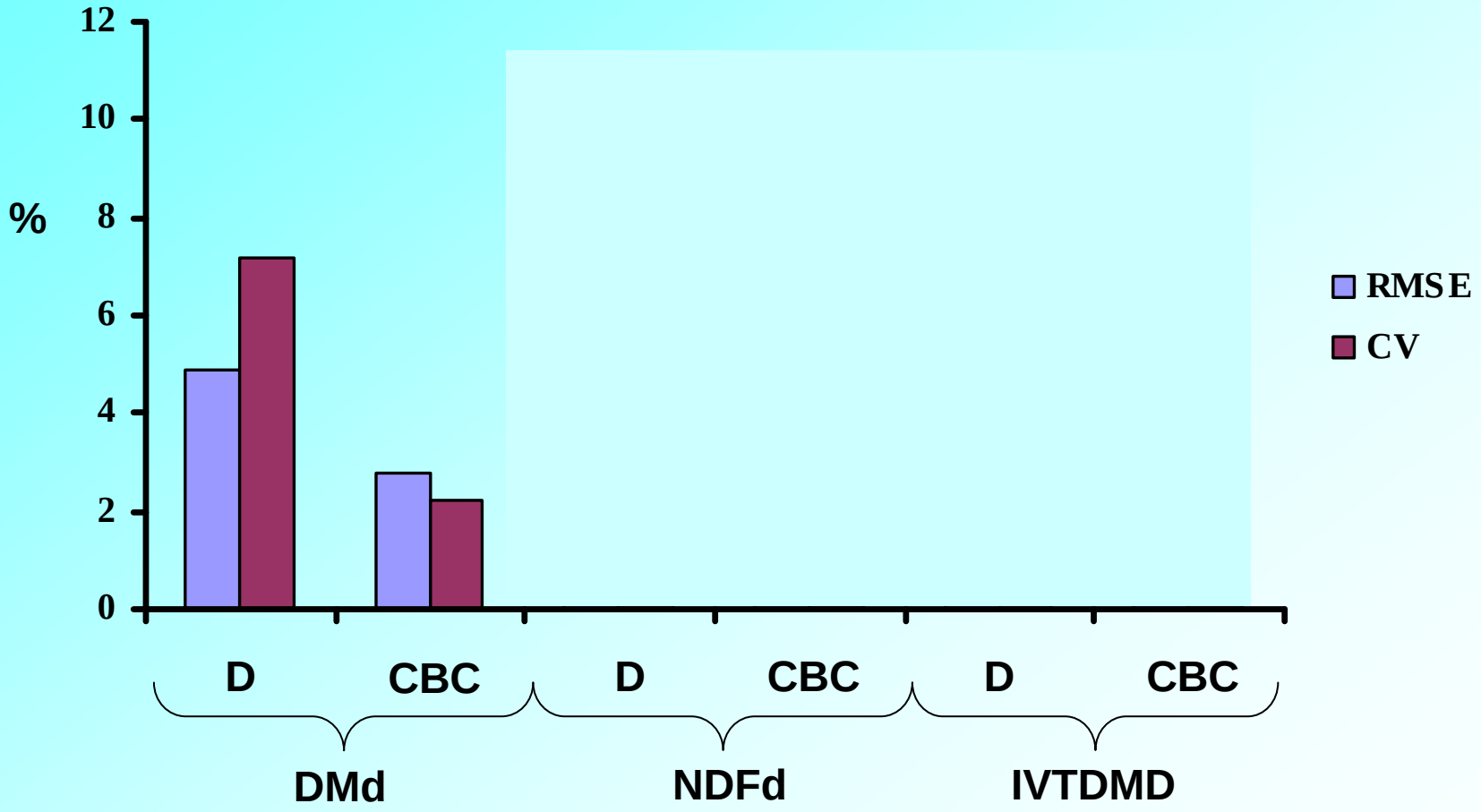
Daisy^{II} *vs.* CBC

Variability of the measurements



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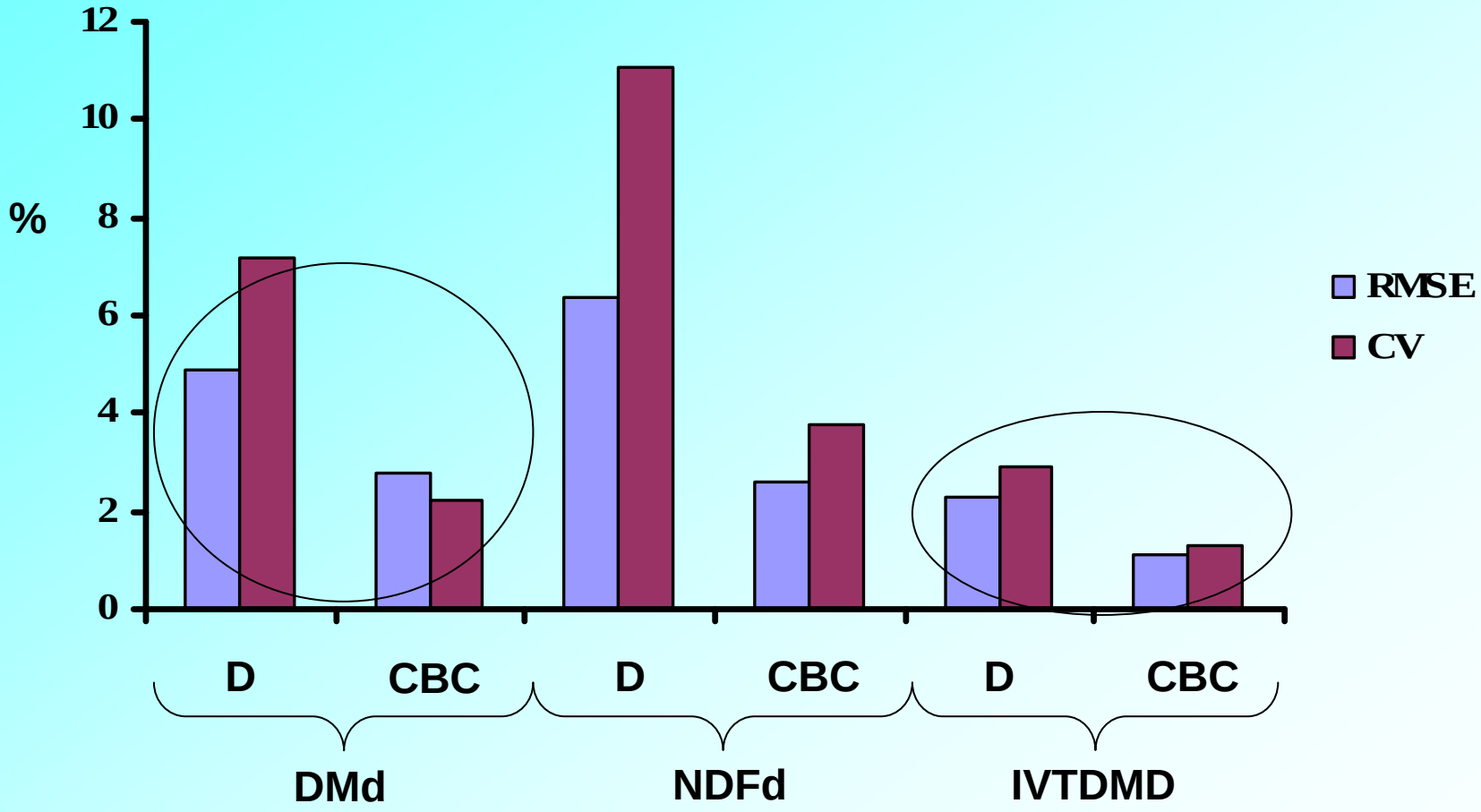
Daisy^{II} *vs.* CBC

Variability of the measurements



D = Daisy^{II}

CBC = Closed Batch Colture

ANOVA of degradability values obtained with Daisy[II]

(Values reported are the Snedecor's F statistic)

	Feed (A)	Incubation (I)	A * I	Jar (J)	I * J	A * J	A * I * J	RMSE
DMd	1986**	30**	41**	2	2	2 **	3**	2.6
NDFd	926**	53**	7**	1	3**	1	2**	4.6
IVTDMD	5018**	79**	12**	0	3**	1	1	1.5

** $P<0.01$

ANOVA of degradability values obtained with CBC

(Values reported are the Snedecor's F statistic)

	Feed (A)	Incubation (I)	A * I	RMSE
DMd	565**	14.6**	1.6	1.4
NDFd	360**	8.7**	1.3	2.1
IVTDMD	887**	6.1**	1.1	1.0

** $P<0.01$

Conclusions

- Daisy^{II} measurements of degradability were:
  - always lower
  - less repeatable

  with respect to those obtained with CBC, both for forages and concentrates

- The degree of correlation of the degradability values provided by two techniques ranged from 83 % (NDF) to 95 % (IVTDMD)

- There were significant effects of:
  - incubation and feed*incubation → for Daisy
  - incubation → for CBC

- The mean CV of the NDF measurements was lower than 4% for CBC and than 11% for Daisy^{II}

- The IVTDMD values were always more repeatable than those of DM degradability

Thank you
for your attention…

Gas production at 48 h (GP48, ml)

Mean and standard deviation of the measurements

Feed	GP48 (ml)	sd
Corn meal	164	16.2
Soybean meal	112	18.8
Sugar beet pulp	156	17.6
Corn silage	129	13.2
Alfalfa hay	82	11.3
Grass hay	105	22.4
Wheat straw	107	12.2
RMSE, ml	16.9	
CV, %	13.8	

Fisher values

	GP48
Feed (A)	322**
Incubation (I)	249**
A*I	6
RMSE	6.0

** $P<0.01$