ROLE AND SIGNIFICANCE OF ASSOCIATIVE EFFECT IN THE ASSESMENT OF THE NUTRITIVE VALUE OF FEEDS

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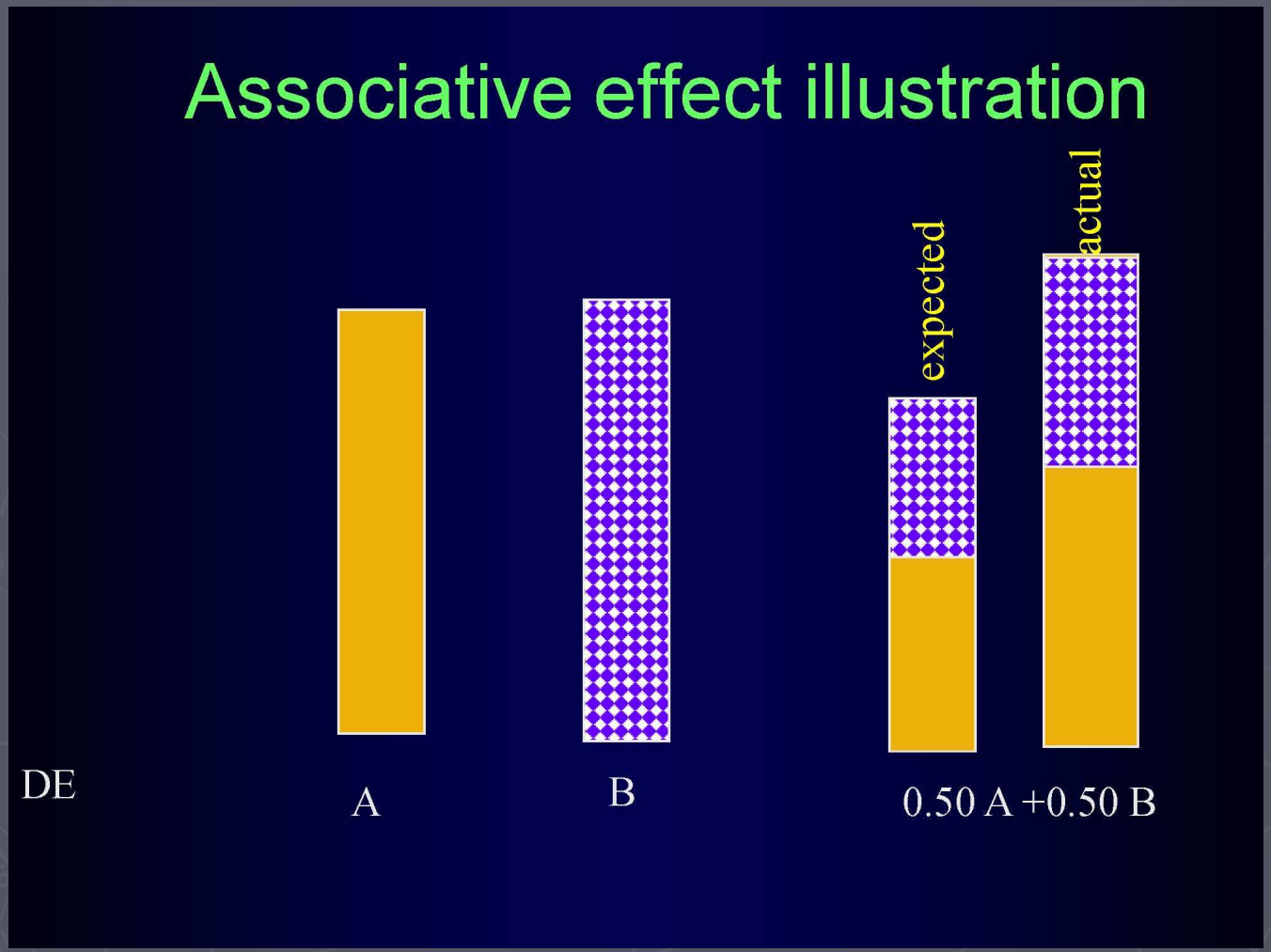
Associative effects

- DEFINITION: Interaction between nutrients in different ingredients in a ration which result in performance that is greater or less than expected from the individual ingredients
- E.g. the NE of a mixed diet may not reflect the NE calculated from the NE intakes of the ingredients
- Reflect non-additivity of nutrients in feeds
- May be positive, negative or absent

Associative effect illustration



Positive associative effects

- 1.Increased fiber utilization after N supplementation in N deficient forages
- 2.Increased fiber utilization after supplementation of roughages with small quantities of sugars
- 3.Increased intake when more than one forage is fed
- 4.Increased microbial protein production due to synchronized / balanced diets

Negative associative effects

- 1.Concentrate supplementation of forage diets in excess of 600 g/kg DM depresses fiber utilization
- 2.Fat supplementation of diets in excess of 60g/kg DM depresses fiber digestion
  - –Coats particles thereby preventing fermentation,
  - –Reduced intake due to chemostatic feedback from high energy diets
  - –Certain PUFAs are toxic to ruminal microbes
- 3.Presence of antinutritive factors which hinder nutrient utilization

Factors determining associative effects

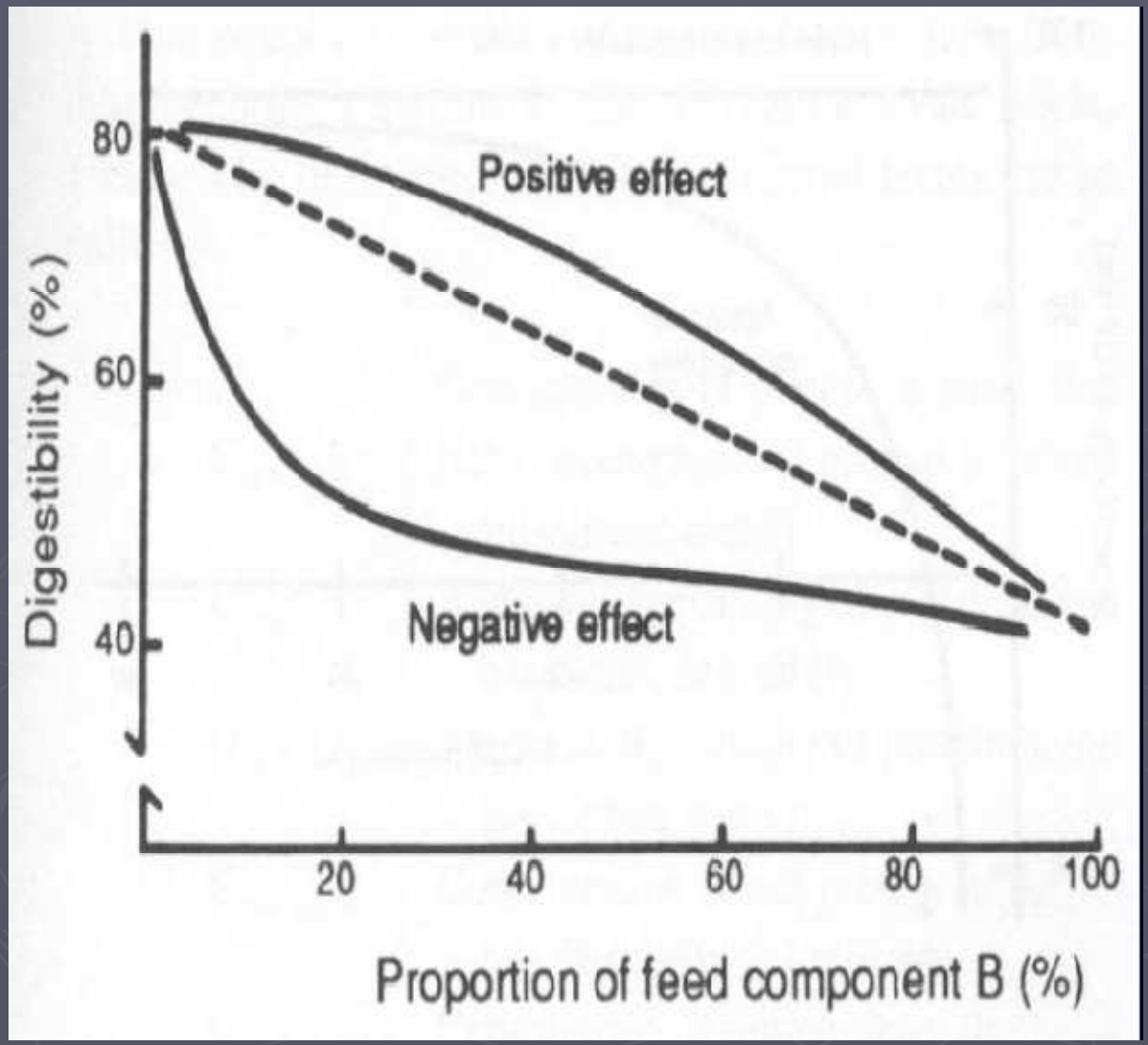
- Ingredient palatability
- Nutrient content of dietary ingredients
- Nutrient ratios e.g. energy:protein NSC vs NDF; NSC vs RDP
- Energy:protein ratio
- Physical form of feed (due to conservation / processing method)
- Microbial activity
- Substitution rate
- Level of feeding and outflow rates

Measuring associative effects

- Feeding supplements at different ratios to a basal diet (Van Soest, 1994).

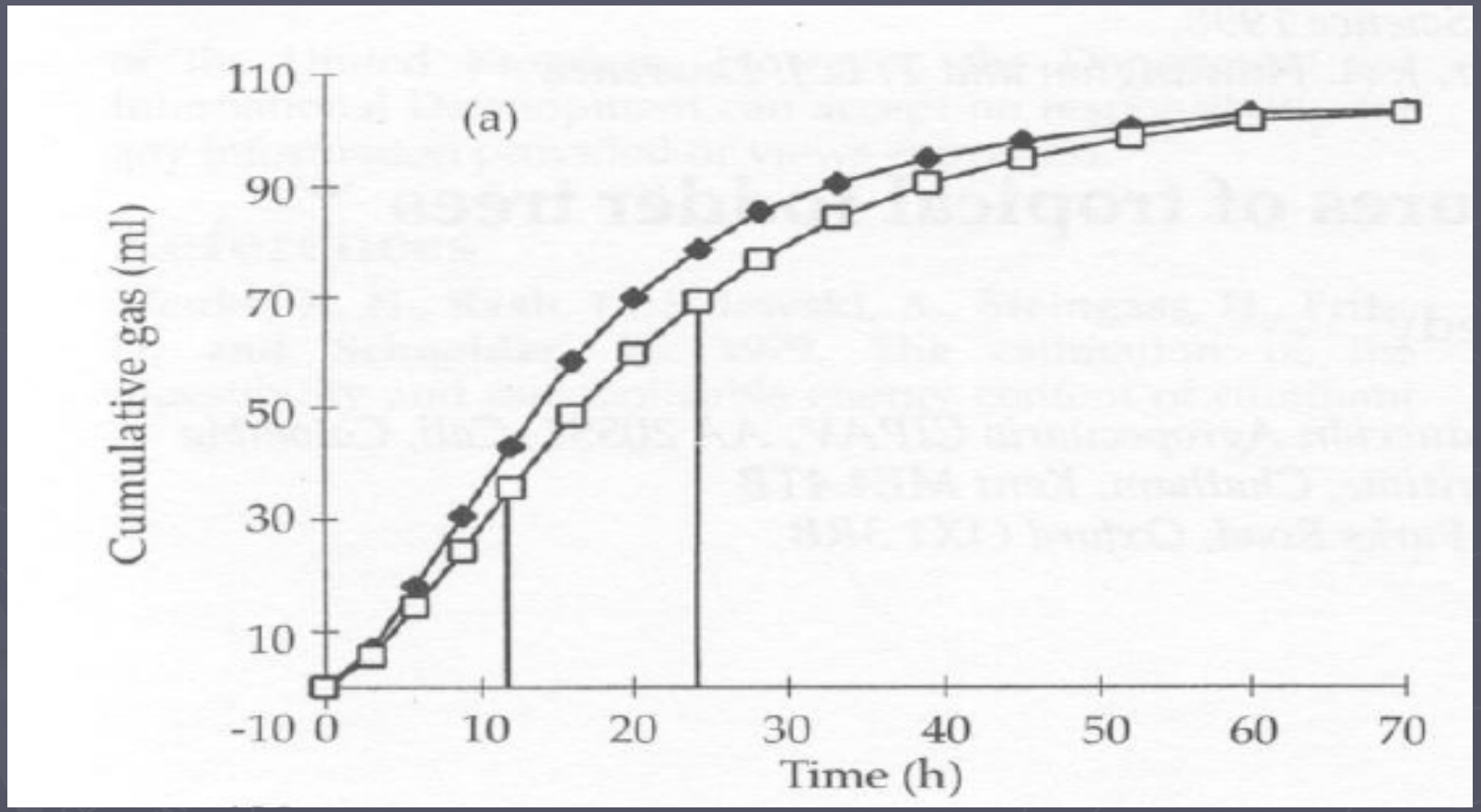
- Statistical methods
  - Continuous analysis
  - Response Surface Methodology

Estimation of associative effect



(Van Soest, 1994)

Associative effect of fermenting two forages together



Expected data – obtained from fermentation of individual components, i.e. half of (100:0 and 0:100); observed data (50:50)

Rosales et al., 1998

Associative effects –implications

- Not built into most current feeding systems yet they:
  - Over or undervalue nutrients / ingredients
  - Prevent determination of digestibility of components of a mixed ration by difference.
  - Limit the usefulness of nutritive value indices measured on individual foods.

Purpose of the present research

- To examine the influence of basic ration on *in sacco* rumen degradability of dry matter and protein of individual feeds and their combinations.
- Is the associative effect between feeds real?

Experimental Protocol

- Animals:

  three non-lactating and non-pregnant cows with rumen fistula

- Nutrition:

	Ration A	**Ration B**
	Wheat straw	Corn silage
	Meadow hay	Meadow hay
	Conc. mixture	Conc. mixture
DM intake, kg/cow	5,2	5,9
CP, kg DM/cow	1,9	2,05
NE, MJ/kg DM/cow	127,6	135,45

Experimental Protocol 2

- *In sacco* incubations: total 27 variants, incl.:
  - Individual feeds – 6 for ration A, 4 for ration B
  - Mixed feeds: 2 feeds together – 8 (A), 4 (B)
    3 feeds together – 4 (A), 1 (B)

Experimental Protocol 3

- Individual feeds

	Ration A	**Ration B**
barley	A1	-
corn	A3	A2
wheat	A5	-
expeller	O1	-
meadow hay	B1	B2
corn silage	S1	S2
fodder beet	-	E2

Experimental Protocol 4

- Mixed feeds: 2 feeds together

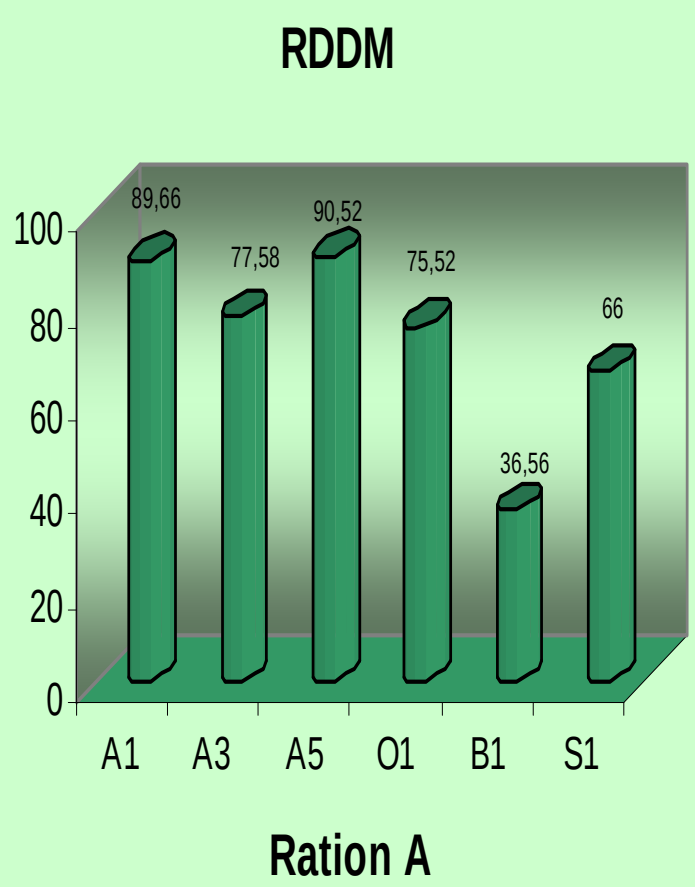
Ration A	**Ration B**
A1A3	S2A2
A1A5	B2S2
O1A1	B2A2
O1A3	E2B2
B1A1	
B1A3	
B1O1	
S1A3	

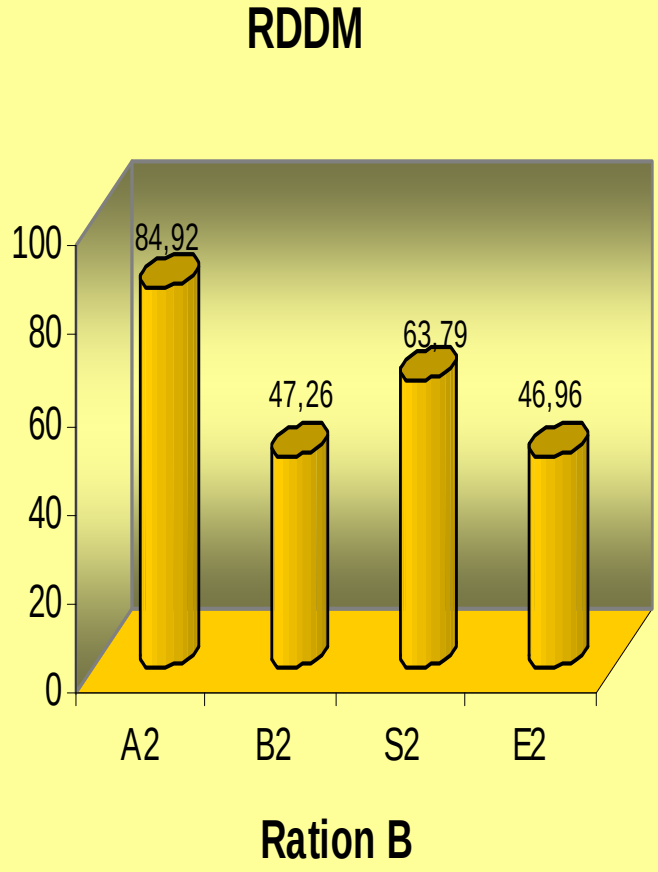
Experimental Protocol 5

- Mixed feeds: 3 feeds together

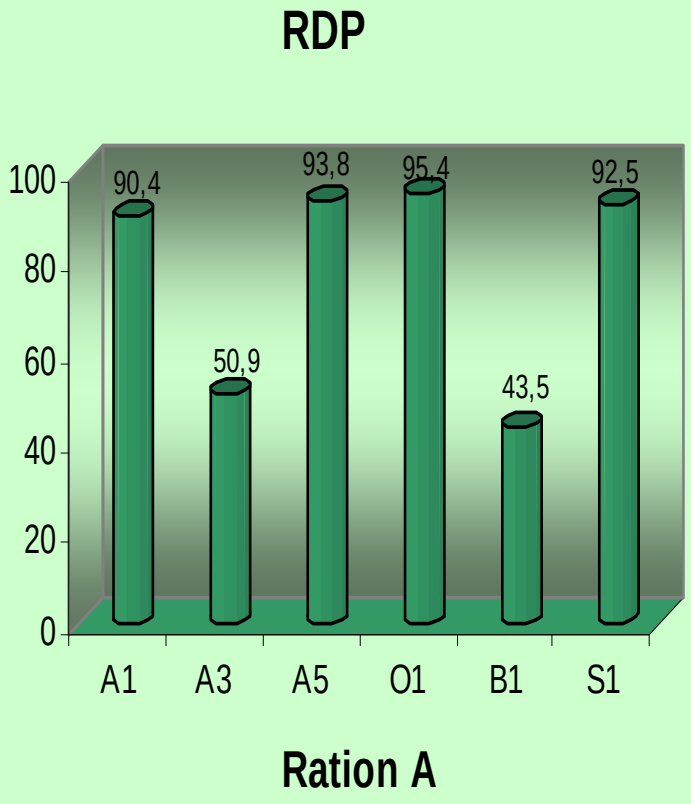
Ration A	**Ration B**
A1A3A5	E2B2A2
O1A1B1	
O1A3B1	
B1O1A1	

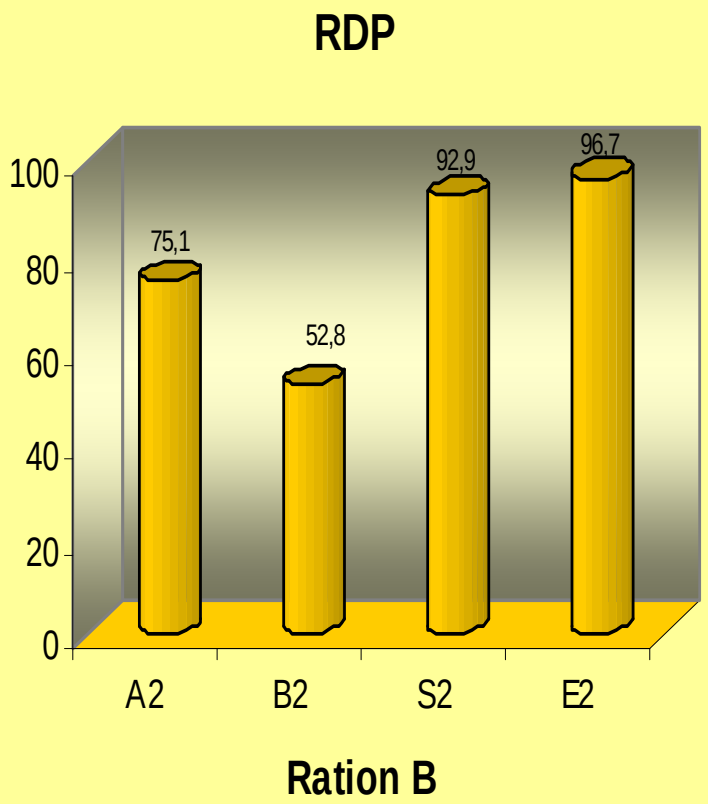
Results 1: Single feeds - RDDM



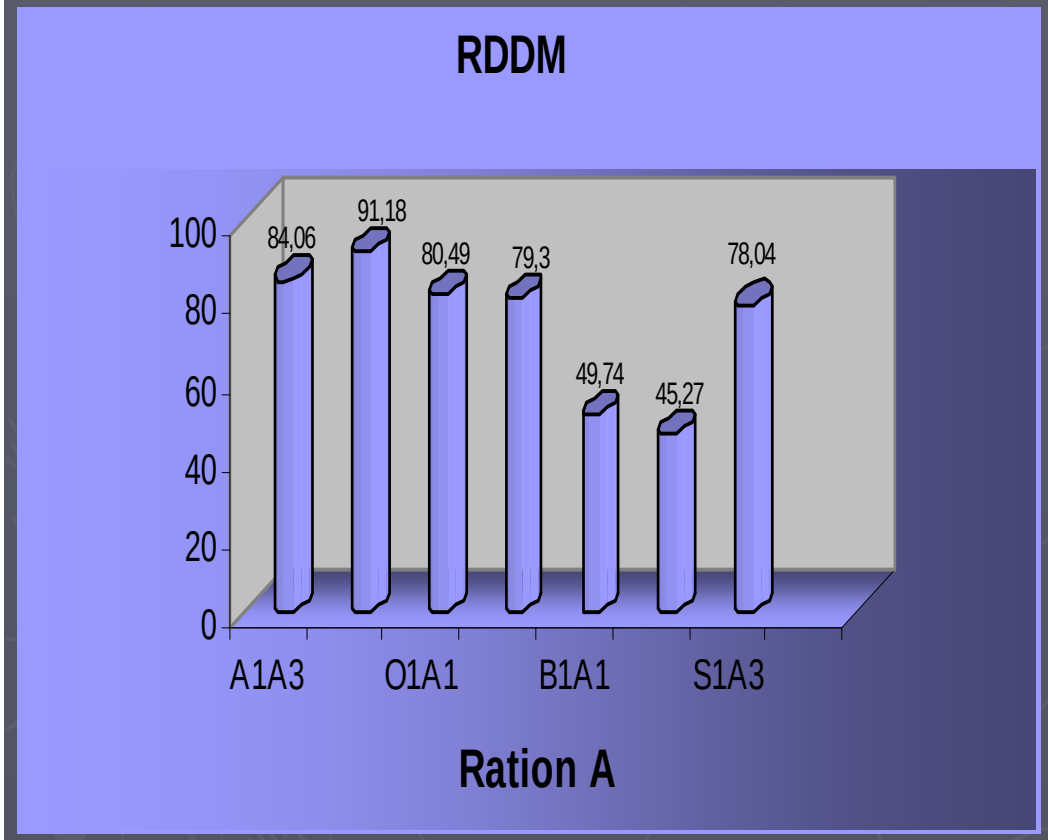


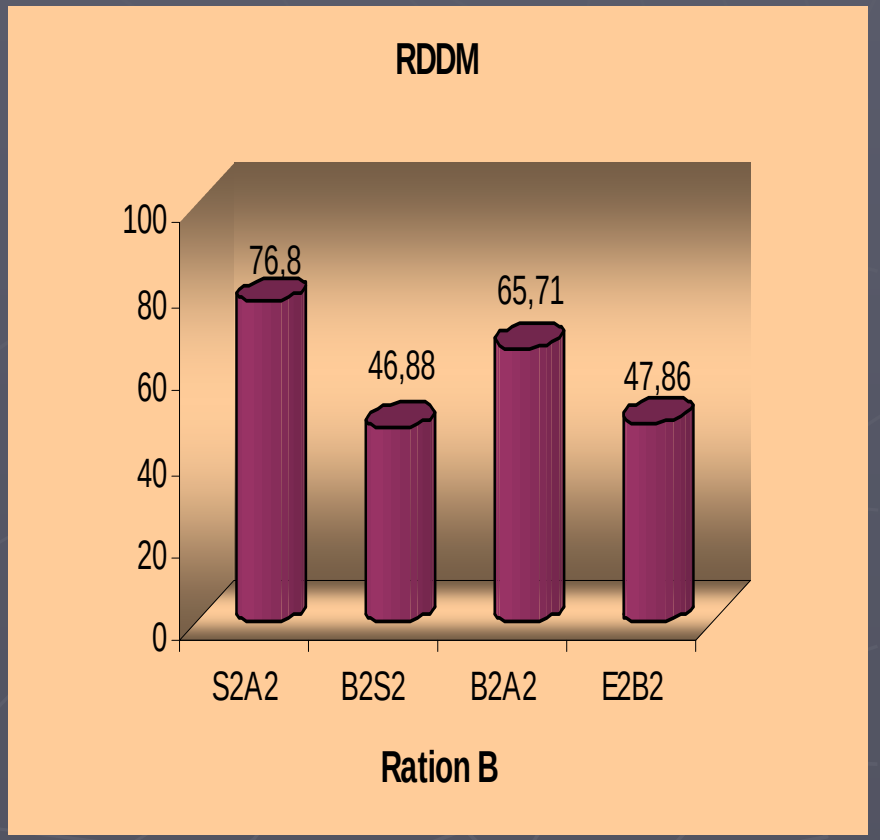
Results 2: Single feeds - RDP



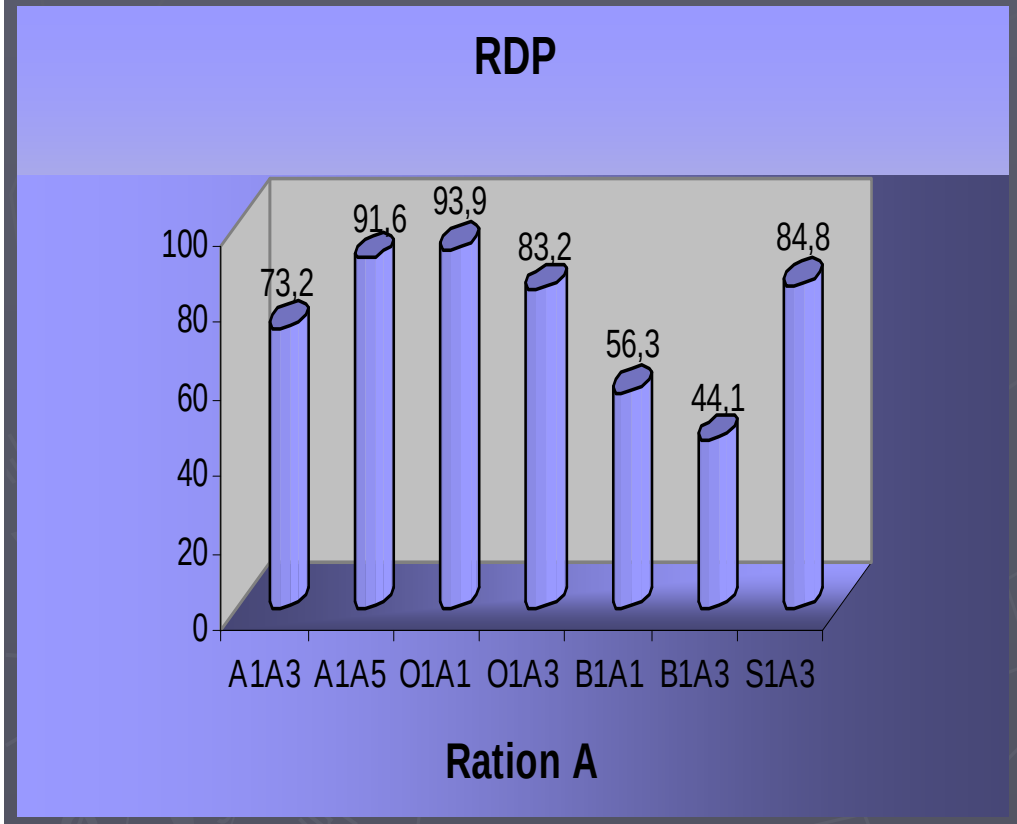


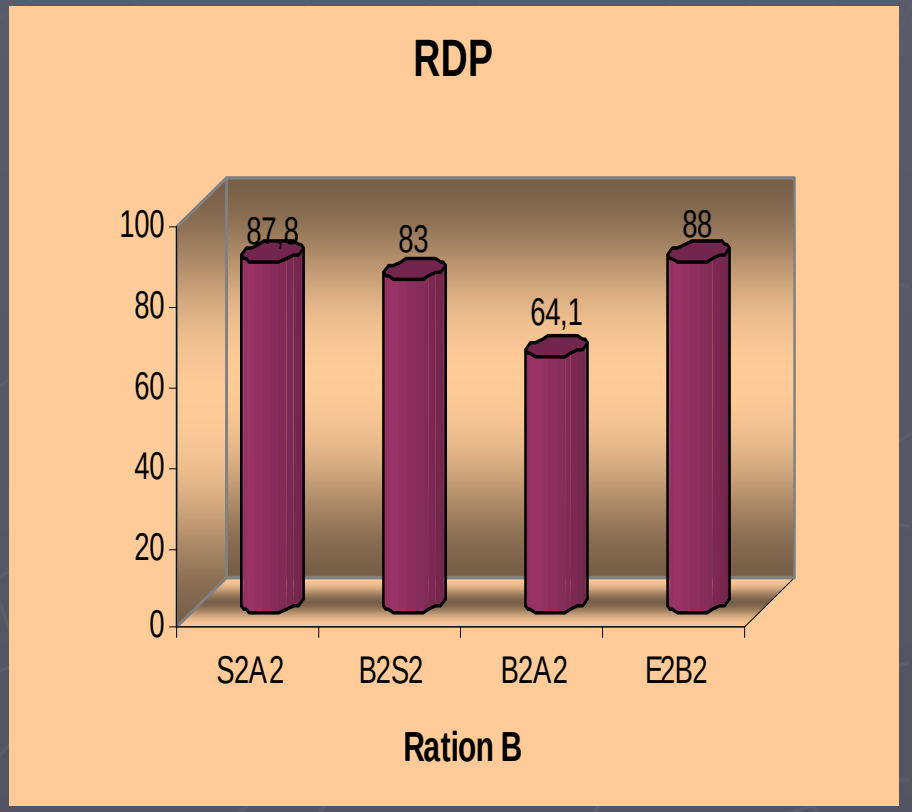
Results 3: 2 feeds together - RDDM



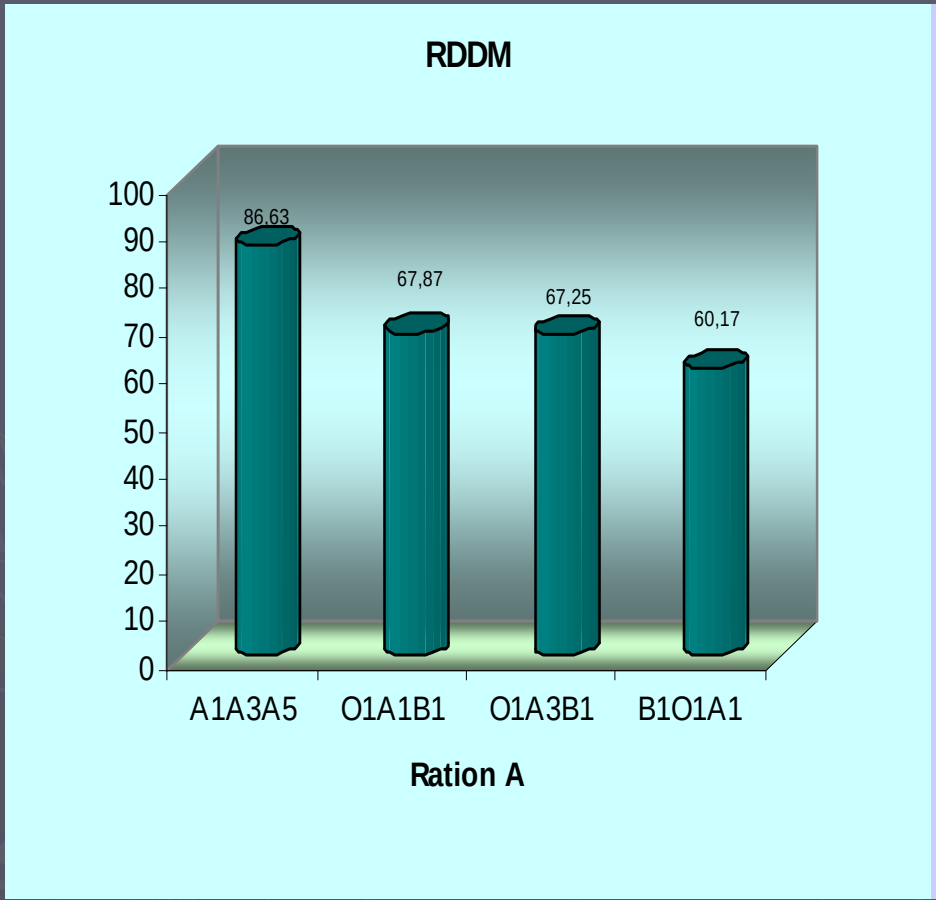


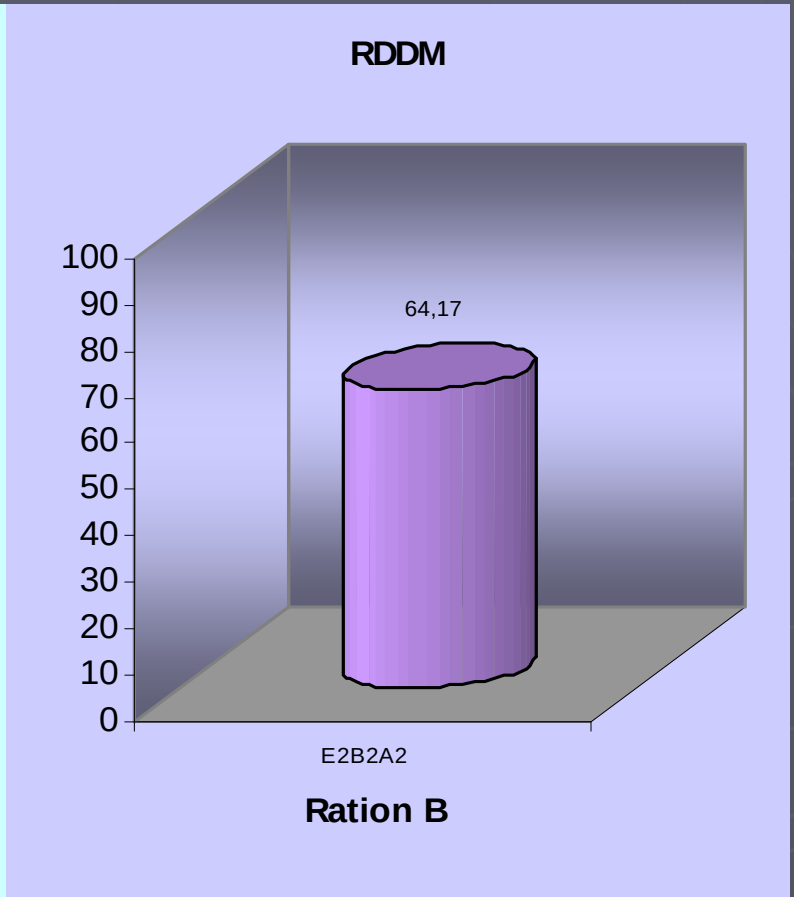
Results 4: 2 feeds together - RDP



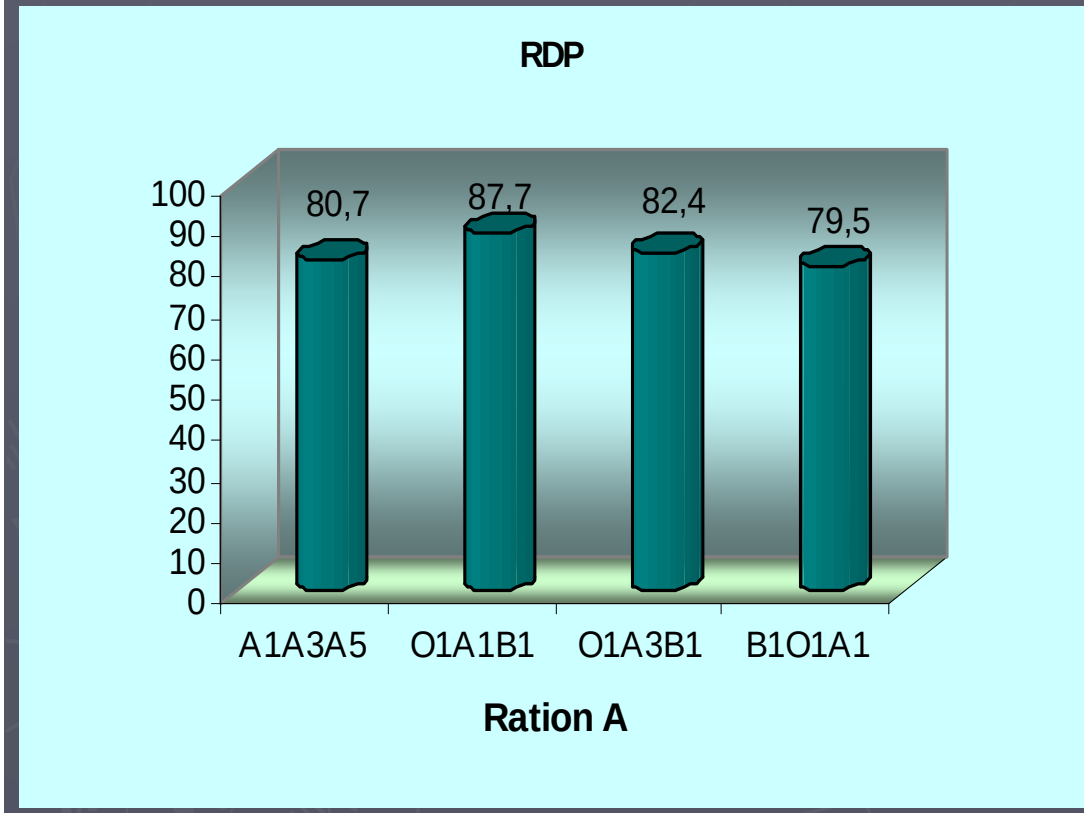


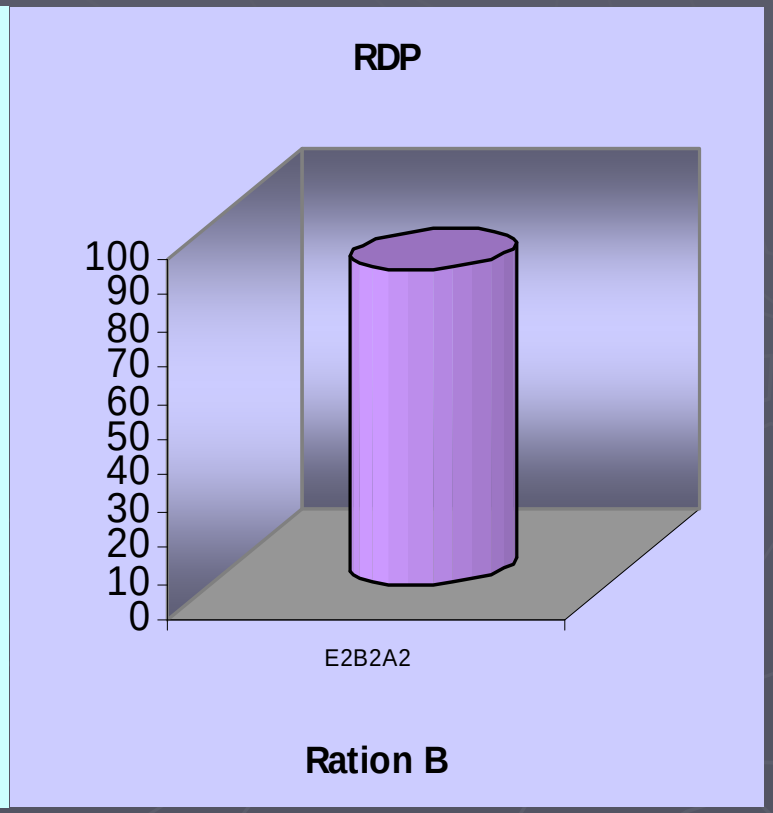
Results 5: 3 feeds together - RDDM



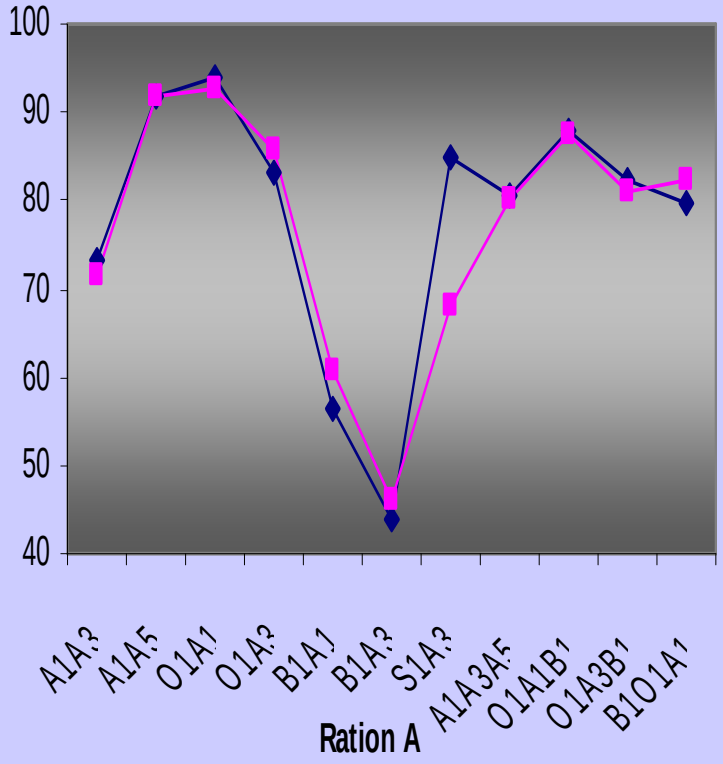


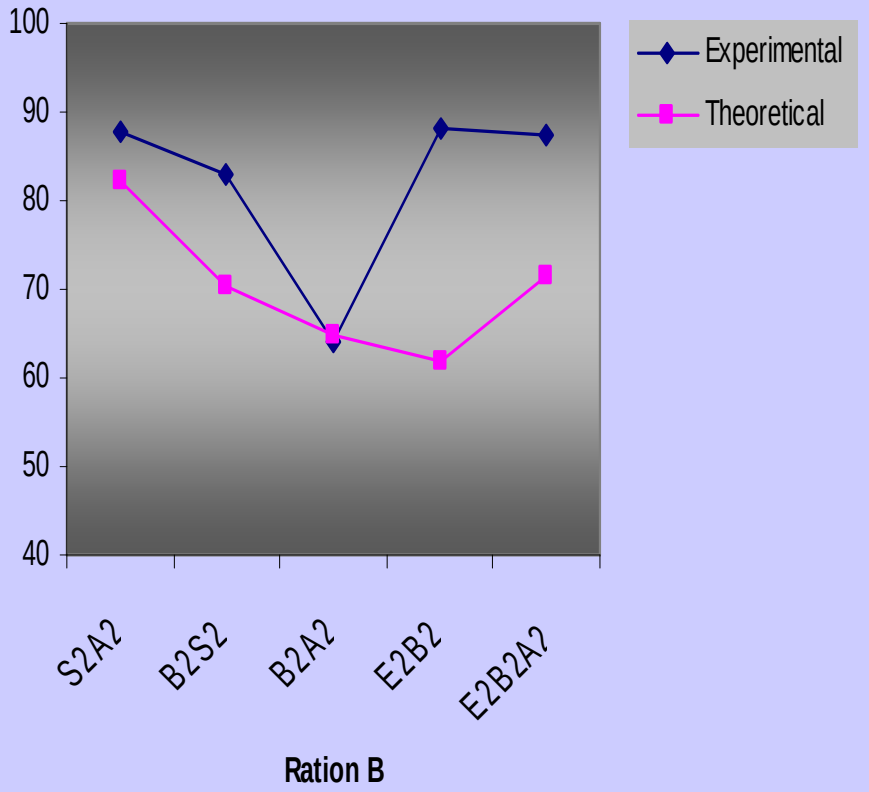
Results 6: 3 feeds together - RDP





Results 7: Experimental and theoretical RDP values





CONCLUSIONS

- Degradability of protein in the rumen *in sacco* in mixture of feed with bulky feeds - fodder beet, silage - change significantly compared with theoretically calculated value of the data for degradation of protein in individual feeds.

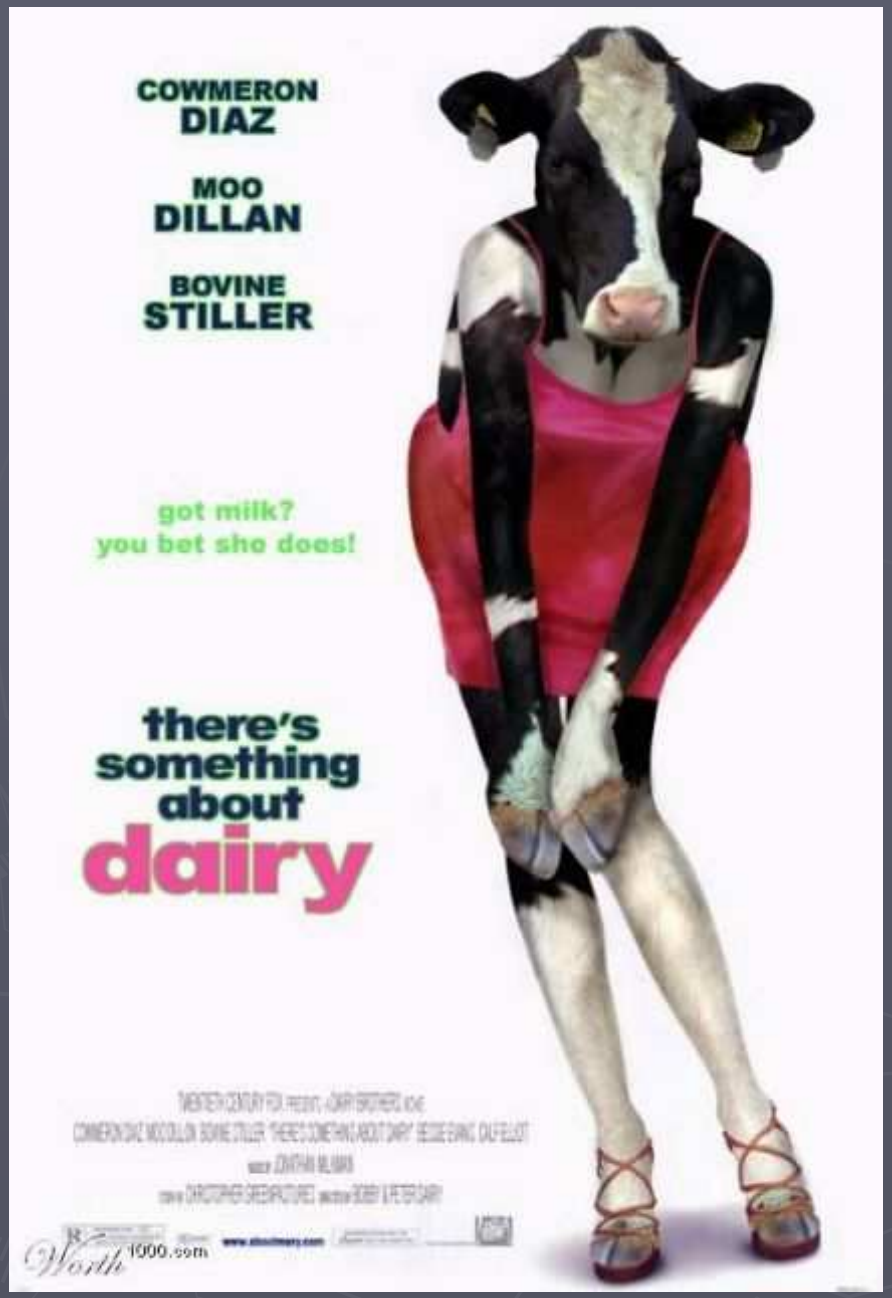
- Experimental obtained values for RDP for combination of concentrates did not differ from the estimated value of the data for single feeds.

- It is necessary to characterize the degree of influence of additivity factor for bulky feeds and in any conditions and the limits of its manifestation.

CONCLUSIONS 2

- Associative effects are real and nutritionists should complement the science of feeding, with the "art" of feeding, by utilizing positive associative interactions….. to increase flexibility of diets as typical grain and roughage prices fluctuate.

- Negative interactions must also be avoided.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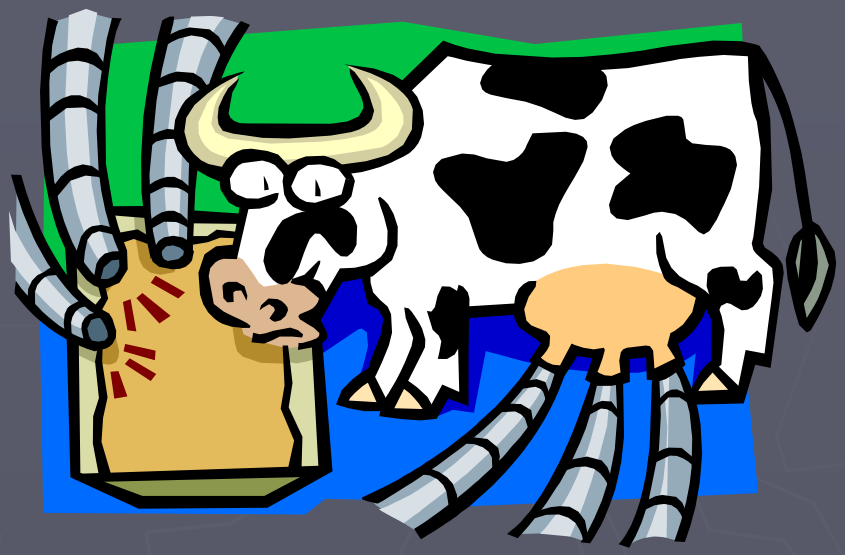
DIAZ
MOO
DILLAN
BOVINE
STILLER
got milk?
you bet sho does!
there's
something
about
dairy



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