



# Leaching of minerals from shrimp feed pellets

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## *Introduction (1)*

- The main difference between shrimp and fish feeds is the time between feeding and ingestion by the animals.
- Before shrimp eats the feed pellet, this pellet has been submerged in water and some nutrients have leached out of the pellet.
- Some substances have to leach out of the pellet to attract the shrimp to it. These are the attractants.
- Other essential nutrients also dissolve and are lost.



## *Introduction (2)*

- During the submersion in the pond water 2 interactions between the pellet and the pond water occur:
  - 1. Components of the pellet leach into the water
  - 2. The pellet absorbs water, so the composition of the pellet that the shrimps are consuming changes according to the water composition (salinity, mineral composition)



## *Introduction (3)*

- a method to compare leaching and water stability between different feeds is important. This method should correspond as much as possible with the conditions in the shrimp pond where this feed will be used (average time before consumption, salinity of the pond water, etc.)
- So the method could change according to the farm this feed is produced for.

In general: Find out what happens with the pellet and its nutrients

- Find out which parameters are influencing the leaching
- Find out which nutrients leach at what rate.
- Evaluate coating with fish oil as a solution to prevent too much leaching.





Pelleting system:

- Pelletmill with triple preconditioner
- Postconditioner
- Counterflow cooler

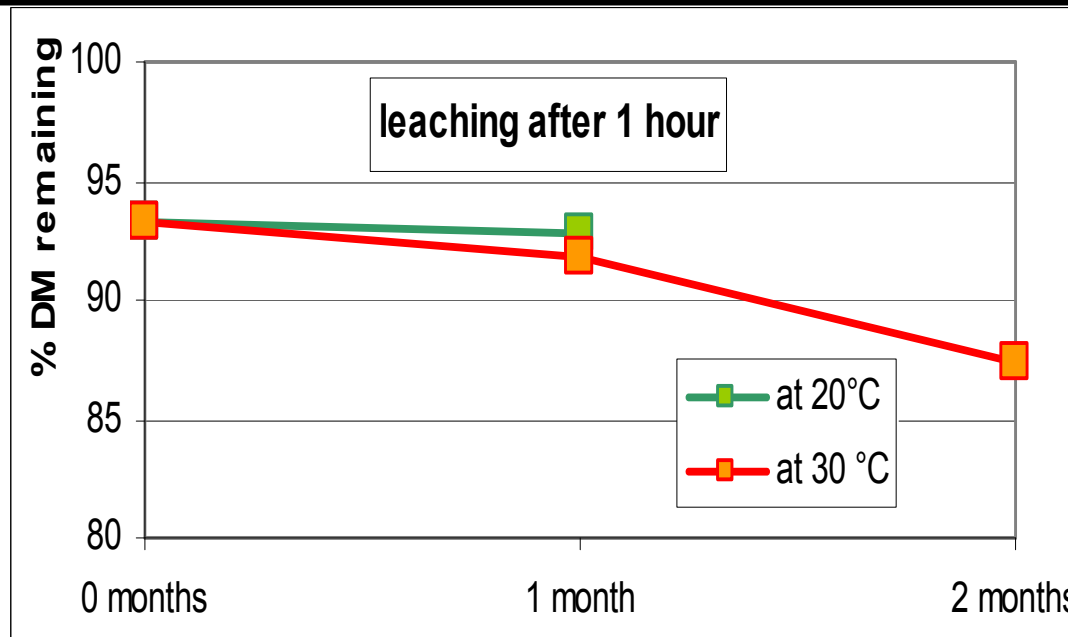
- Pellets are submerged in sea water during 0.5, 1 & 2 hours, without shaking
- They are then dried and the leaching loss is measured.





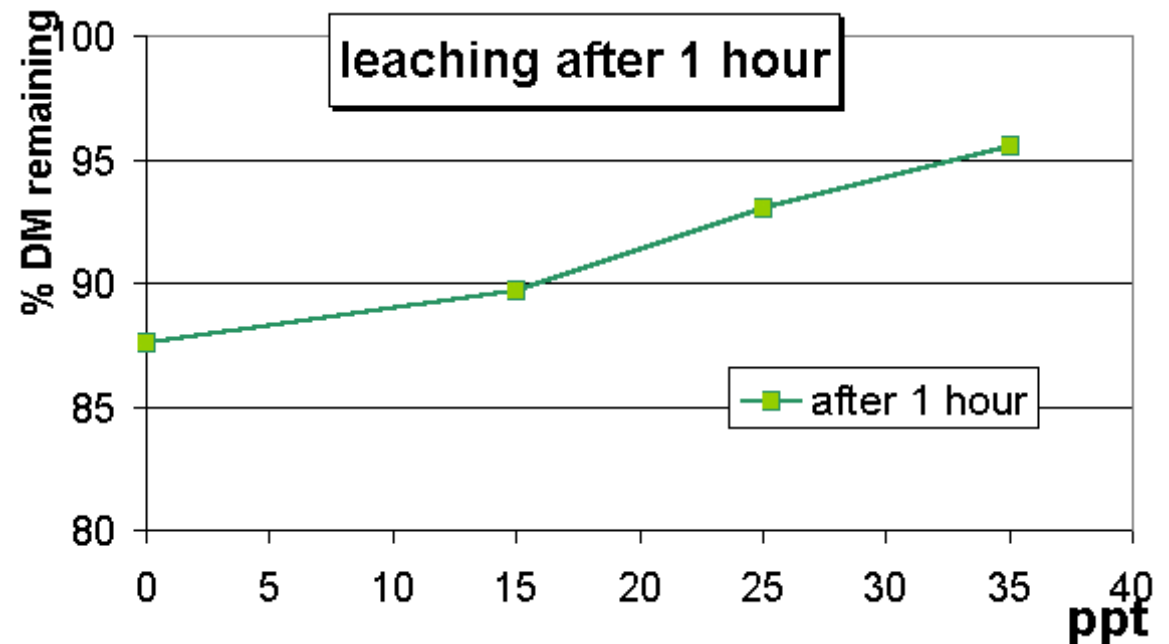
# Exp.1 - effect of storage & T° on leaching

Age of the feed	Loss after 0.5 hours	Loss after 1 hour	Loss after 2 hours
0 months	3.65	6.65	8.65
1 month at 20°C	4.13	7.27	8.99
1 month at 30 °C	4.96	8.18	9.47
2 months at 30°C	10.44	12.68	14.46

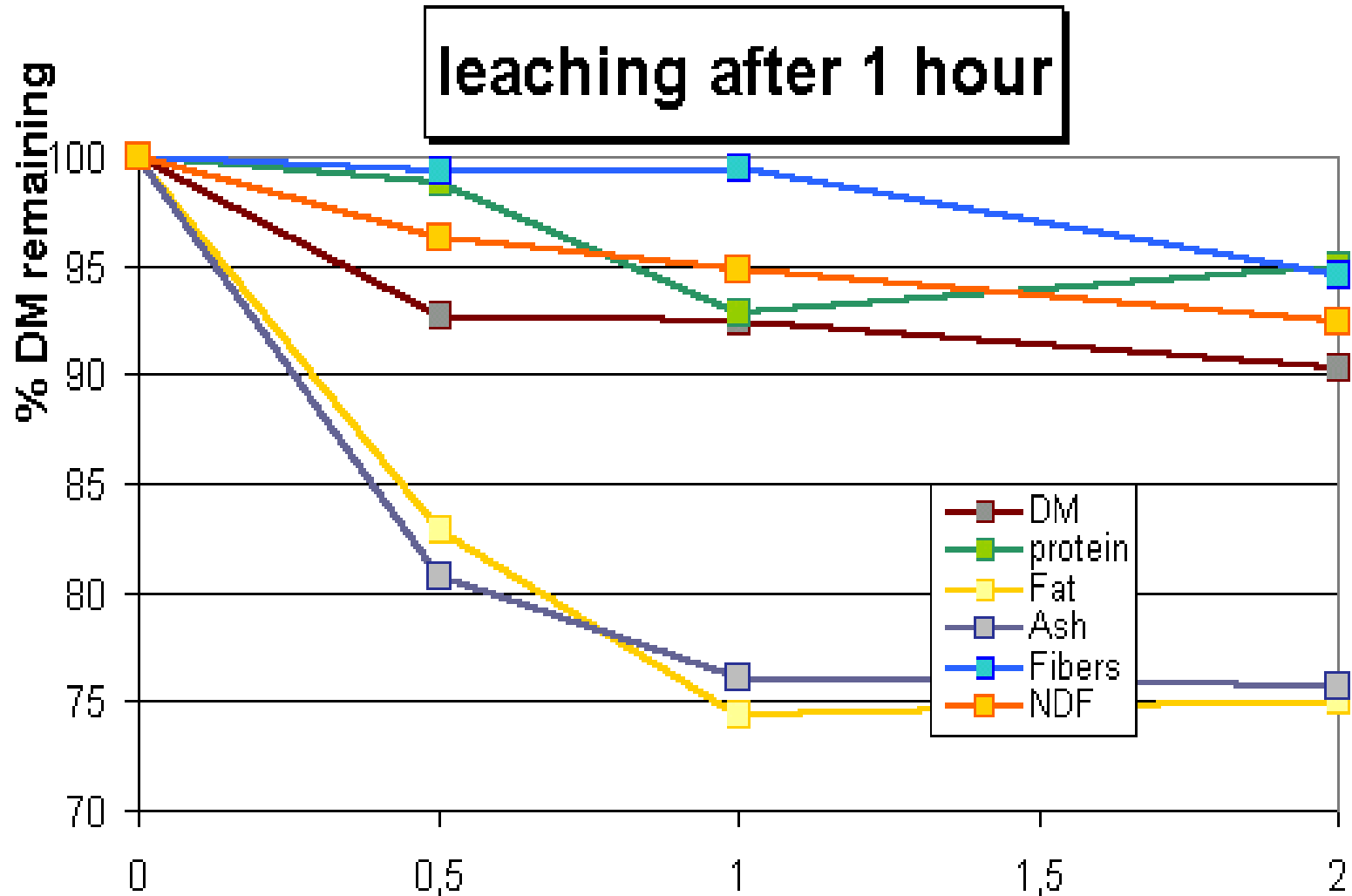


## Exp.2 - effect of salinity on leaching

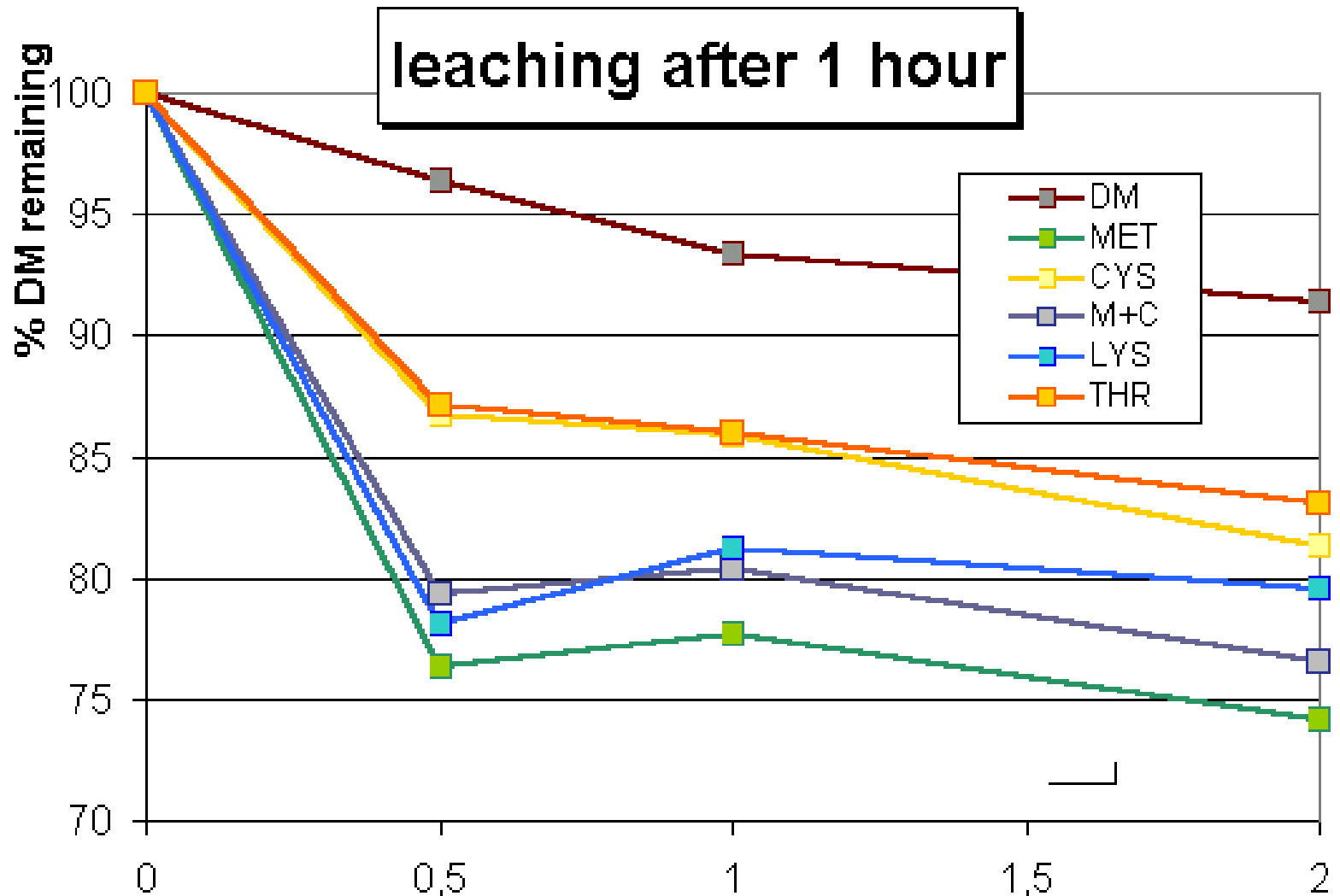
Salinity	% Loss after 1 hour
0 ppt	12.41
15 ppt	10.35
25 ppt	6.99
35 ppt	4.47



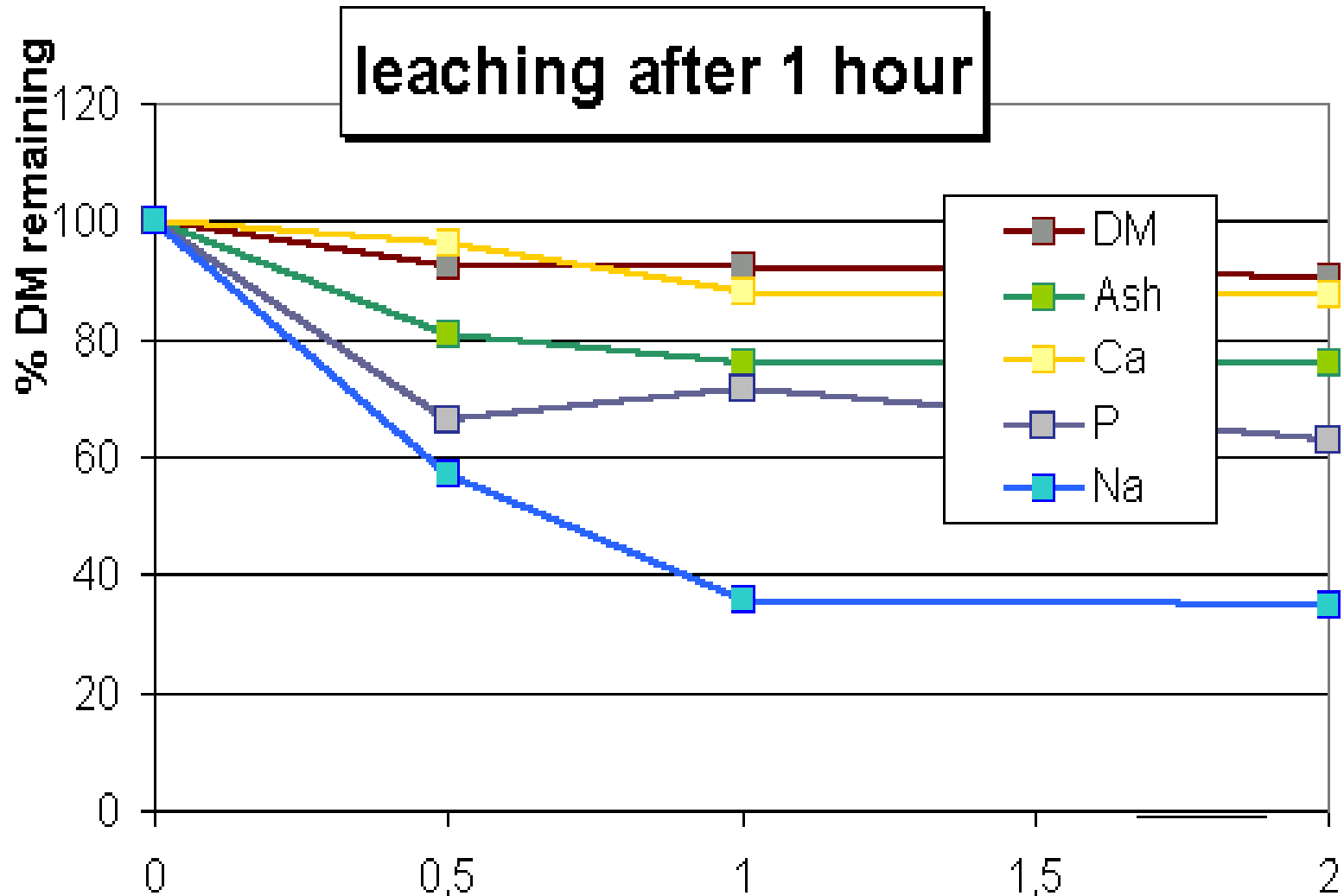
# Exp.3 - selective leaching of the main feed components



# Exp.4 - selective leaching of some amino acids

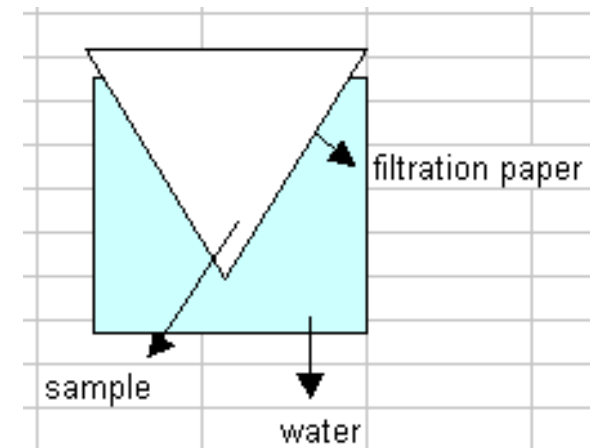


# Exp.5 - selective leaching of some minerals



## Exp.6 - leaching of some raw materials (after 1 hour)

Ingredient	leaching
Danish fish meal	8.93 %
Tuna meal	14.43 %
Shrimp head&shells	18.73 %
Flashdried shrimp meal	36.27 %
Squid liver powder	29.53 %
Wheat flour	14.06 %
High protein flour	21.10 %
Precooked flour	16.45 %
Wheat gluten	5.67 %





## *Exp.7 - leaching of vitamin C (AA) Material & Methods (2)*

- 3 levels of AA\* in the feed mixed before pelleting
- 2 levels of additional AA, solved in water, sprayed on the pellet and the pellet is dried
- Pellets non coated or coated with 2 and 4 % fish oil
- Leaching (after 1 hour), method as described before

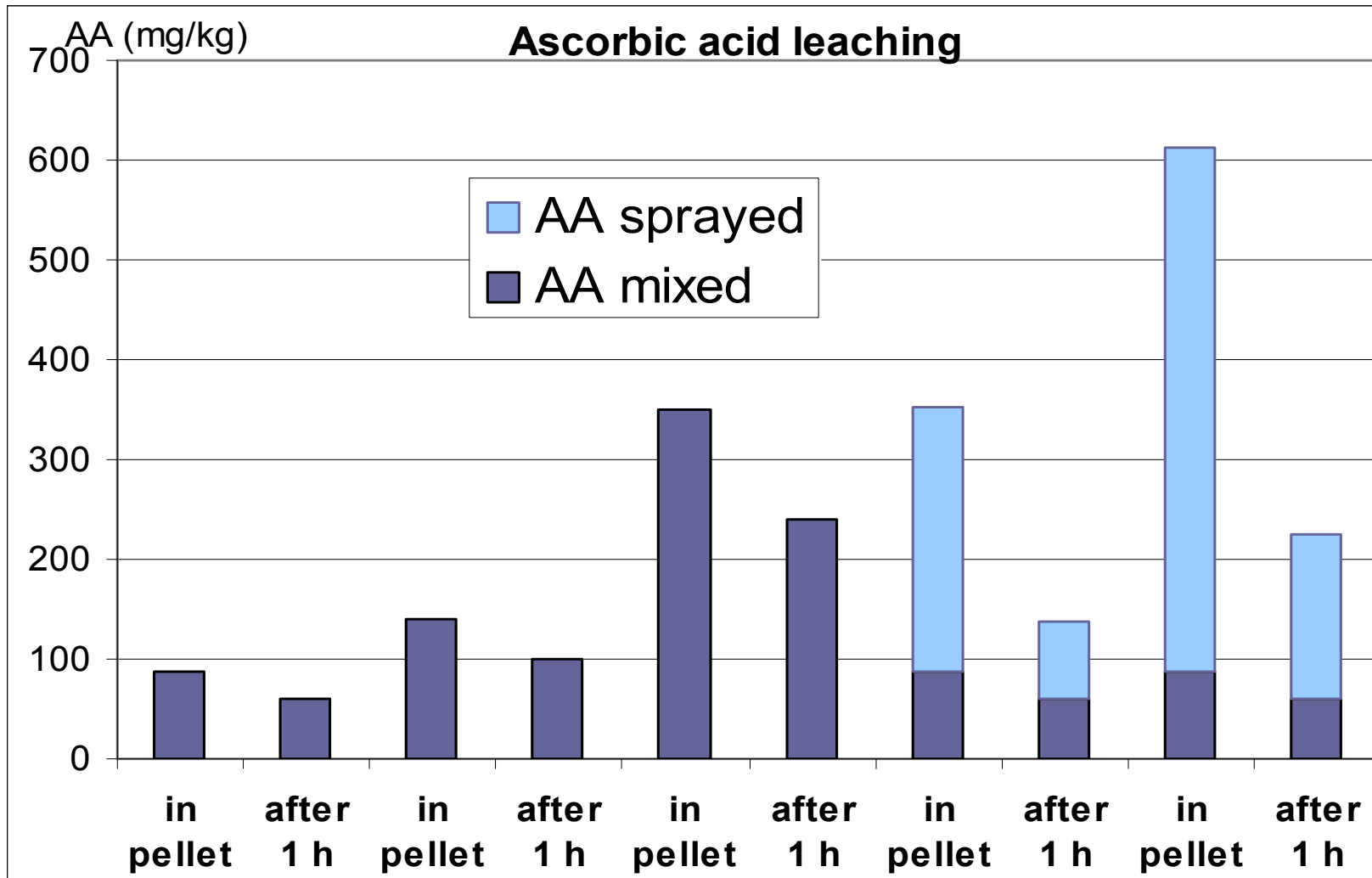
AA\* source: Rovimix C35



## *Exp.7a - Retention of Ascorbic acid in the pellets after submersion in water*

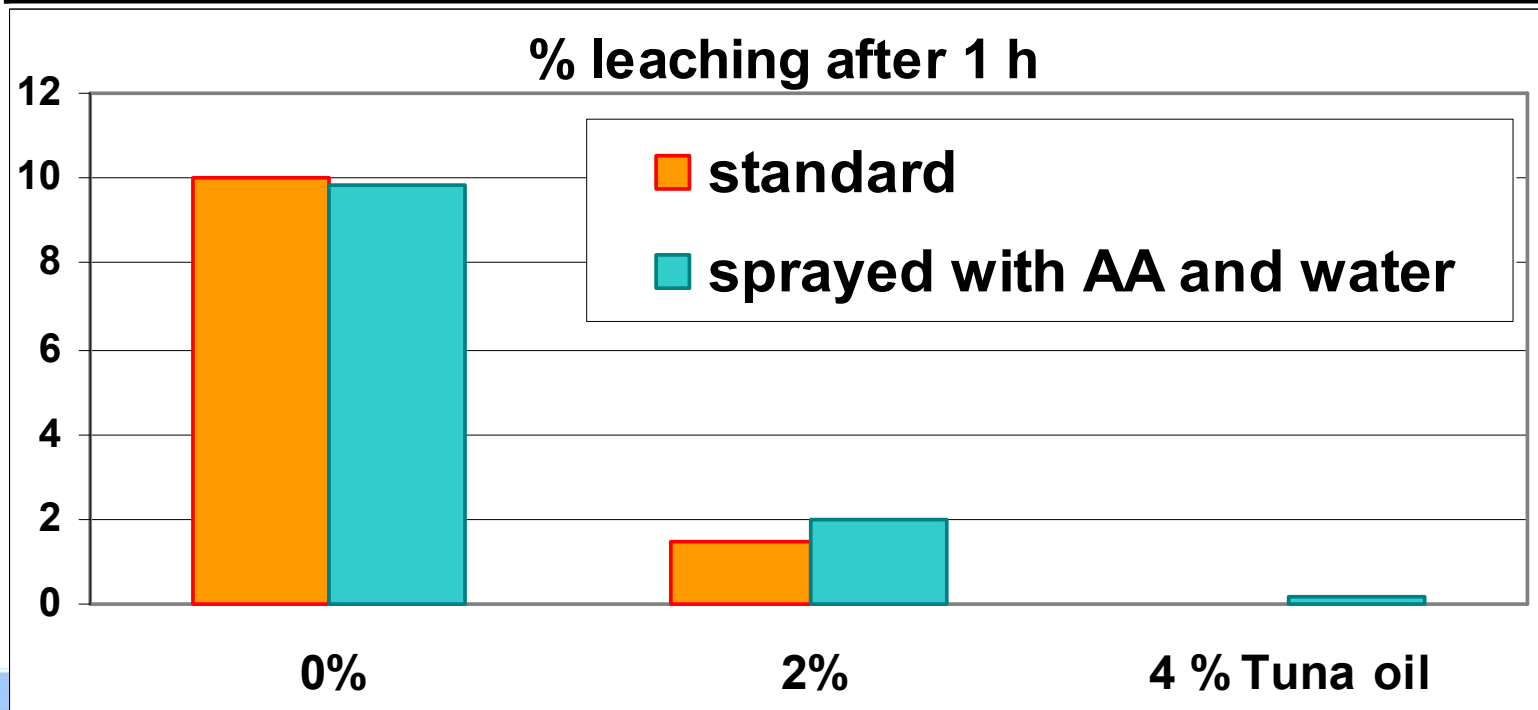
AA in pellet	AA analyzed	AA analyzed after 1 hour	% retention
87.5		61	69.7
140	122	99	70.7
350	336	241	68.9

# Exp.7b - Retention of Ascorbic acid in the pellets after submersion in water



# Exp.8a - effect of oil coating on leaching

nr	Water sprayed on pellet	Tuna oil added	loss after 1 hour
1&2	No	No	10.0 %
3	No	2%	1.5 %
4&6	Yes	No	9.8 %
5&7	Yes	2%	2.0 %
8	Yes	4%	0.2 %





## *Exp.8b - Effect of Fish oil coating on retention of Ascorbic acid in the pellets*

nr	AA in pellet	AA added	Total AA	oil	AA after 1 hour	% retention	% retention of added AA
2	87.5		87.5	No	62	70.86	
3	87.5		87.5	Yes	60	68.57	
4	87.5	263.9	351.4	No	124	35.29	23.78
5	87.5	265.0	352.5	Yes	149	42.27	33.11
6	87.5	522.9	610.4	No	241	39.48	34.38
7	87.5	528.4	615.9	yes	207	33.61	27.58



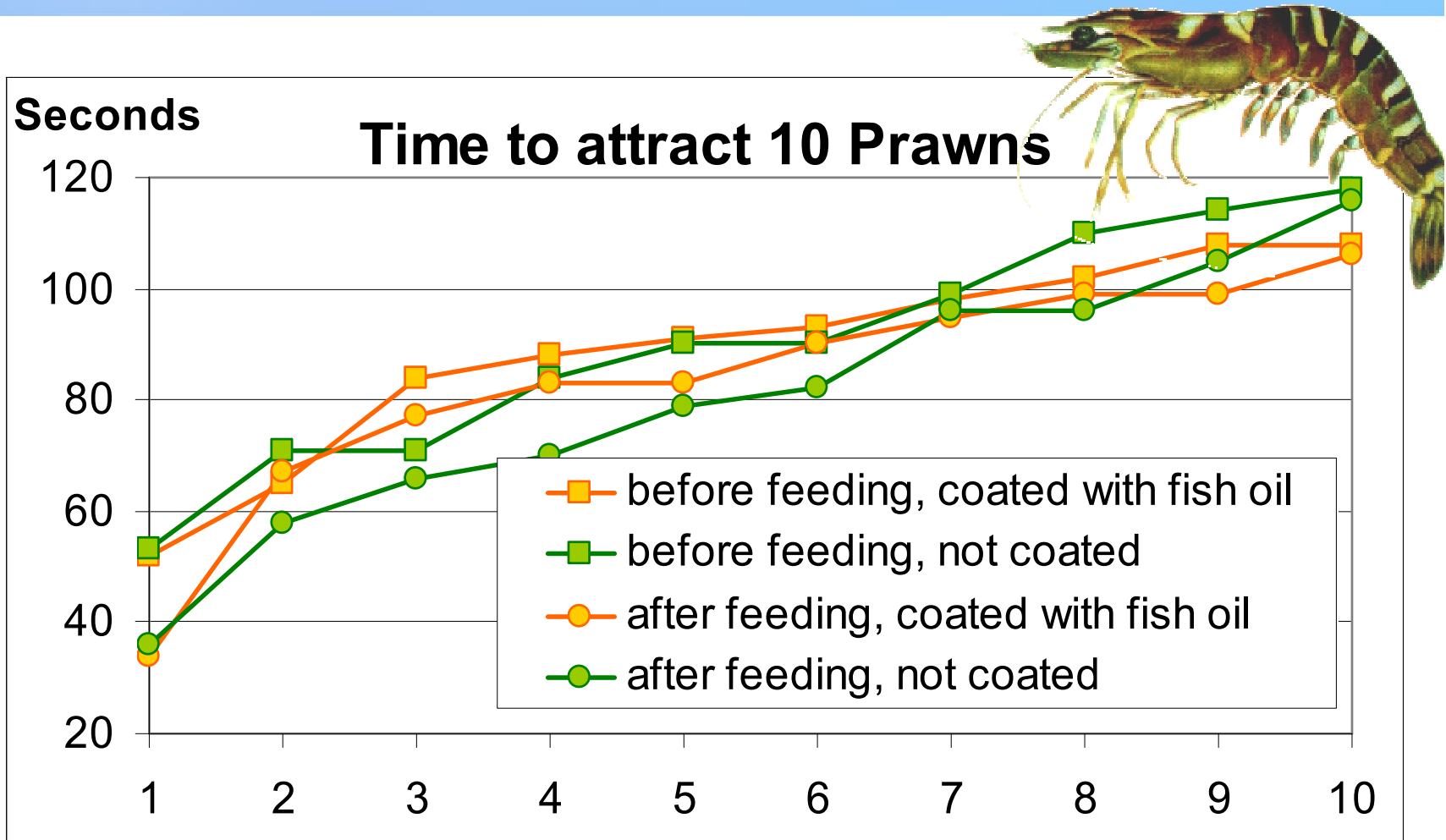
## *Exp.8c - effect of leaching on Fat composition*

### Crude Fat analysis:

Crude fat (%)	2 % Tuna oil added	after 1 hour in water	corrected assuming 2 % leaching
Standard	11.10	11.23	11.00
Sprayed	11.40	11.65	11.41

The fact that the fat level increases means that other parts of the pellet leach more than the fat. When coated at a level of 2 %, the fat is not leaching in the water

## Exp.8d - effect of oil coating on attractability for Prawns (*Penaeus monodon*)





## *Conclusions (1)*

- An evaluating method for leaching and water stability should correspond with the actual utilisation of the pellets
- Not all nutrients leach at the same rate
- This is in particular the case for some minerals
- Adding Ascorbic acid by spraying is costly, not only in labor, but by its inefficiency to supply the AA to the prawns. AA mixed into the feed is more efficient than on farm mixing



## *Conclusions (2)*

- Fish oil coating decreases the leaching in general
- The fish oil coated on the outside does not leach into the water (up to 2 %)
- The fish oil coated on the outside does not affect the attractability to Prawns, not negatively neither positively
- Coating of fish oil does not seem to improve the retention of ascorbic acid in the pellet.



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*Thank you*

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