



Inclusion of extra nutrients in shrimp feed

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Introduction (1)

- Studies on the nutritional requirement of *Penaeus monodon* show that addition of some nutrients above the minimum requirement for growth can increase the resistance of the shrimp to stress factors and diseases. One typical example is vitamin C, but also HUFA, Phospholipids, and astaxanthin.
- Stress can be caused by environmental factors such as temperature and salinity variation, and by the presence of pathogens
- These nutrients also interact with each other.



Introduction (2)

- It can be interesting to increase the content of such nutrients in the feed
- It has become common practice to try to increase those nutrients by coating them on the pellets
- This practice increases the cost of feeds, is labour intensive, and the results are not always clear
- The coating of oil (up to 4%) to prevent leaching out of nutrients can also affect the nutritional balance of the feeds



Goal

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

- Find out how this practice of coating affects the water stability of the pellets
- Find out if adding vitamin C in this way is effective, with other words: Is it reaching the shrimp ?



Material & Methods (1)

- Standards pellets with different levels of Ascorbic Acid mixed before pelleting are used as the basis
- Ascorbic Acid is solved in water and sprayed on the pellets
- Some are coated with 2 % Tuna oil afterwards
- Pellets are submerged in sea water during 1 hour
- They are than dried at low temperature and analysed



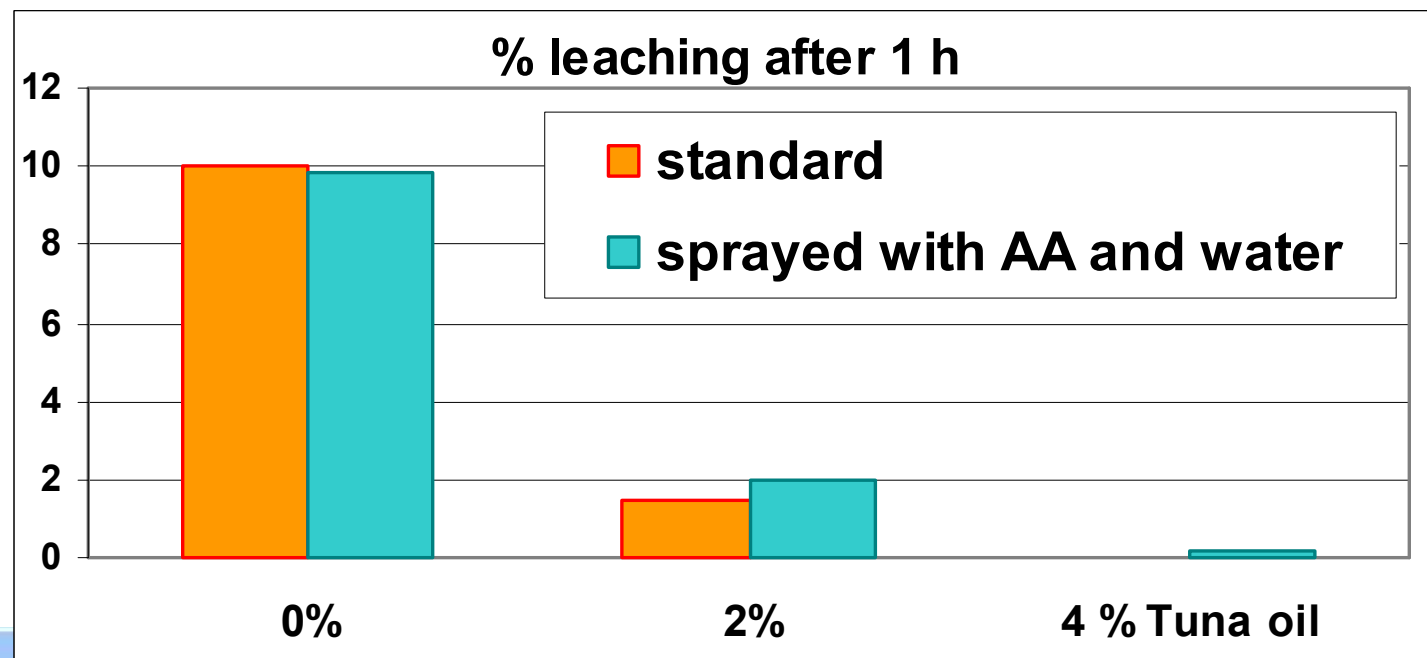
Material & Methods (2)

nr	AA* in pellet	AA added	Coated with tuna oil
1	350.0		No
2	87.5		No
3	87.5		2 %
4	87.5	262.5	No
5	87.5	262.5	2 %
6	87.5	525.0	No
7	87.5	525.0	2 %
8	87.5	525.0	4 %



Results (1) - effect on water stability & 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 %

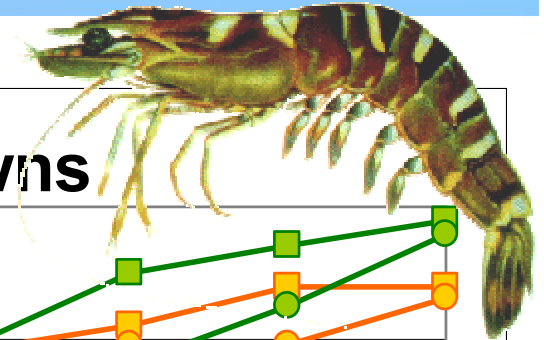
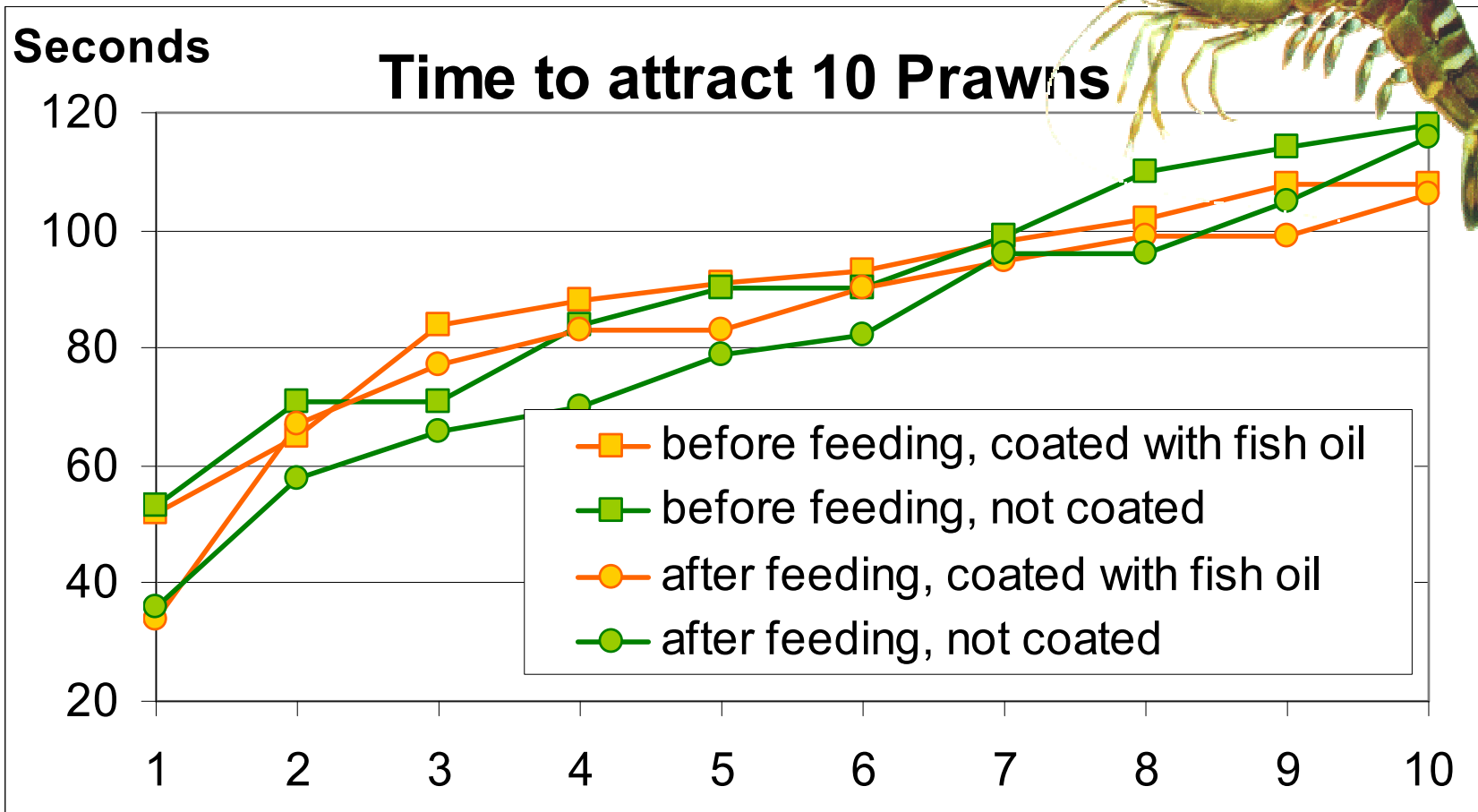


Crude Fat analysis:

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

Results (3) - effect on Attractability for Prawns (*Penaeus monodon*)





Results (4) - Retention of Ascorbic acid in the pellets after submersion in water

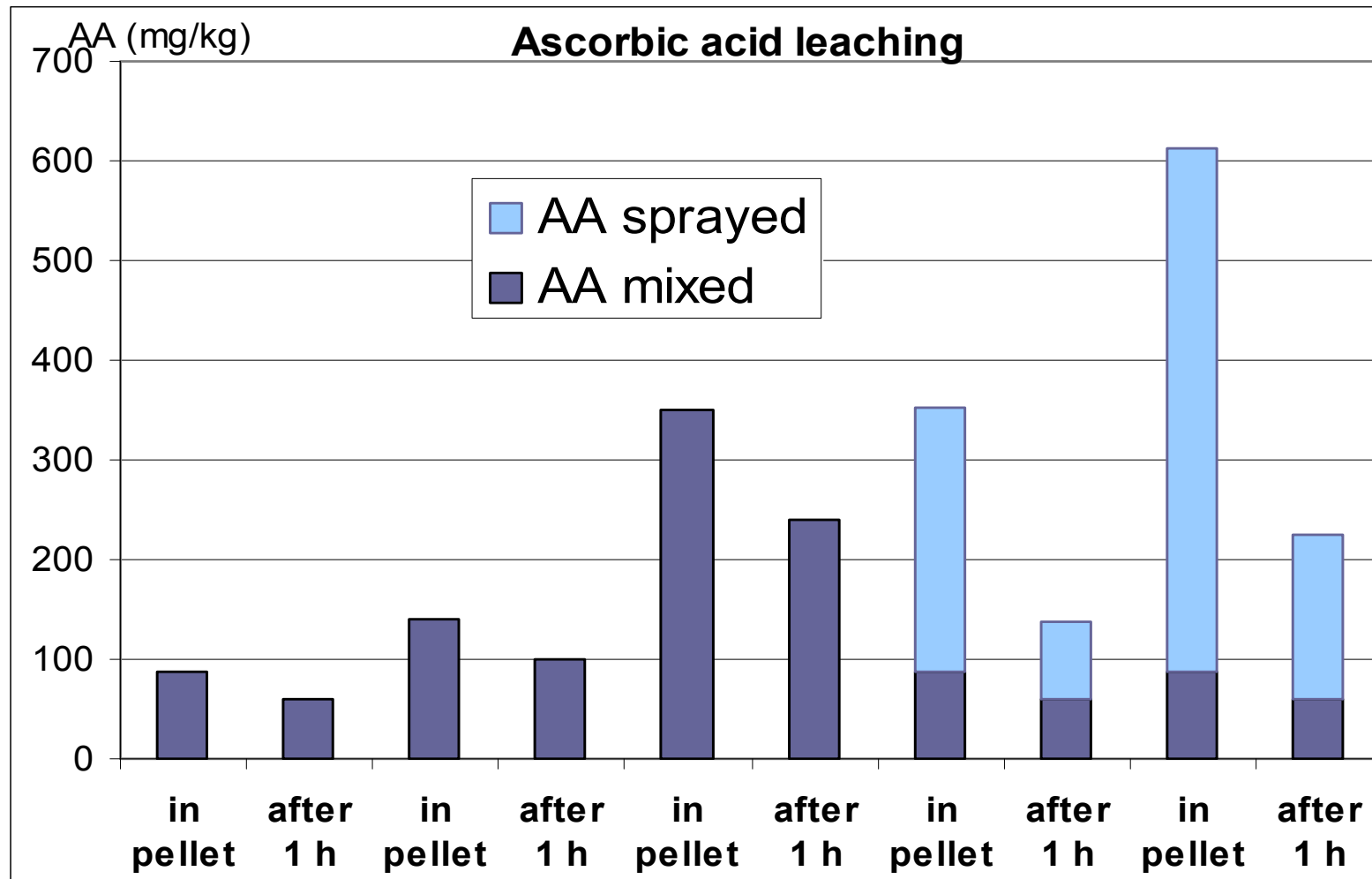
nr	AA in pellet	AA analyzed	AA analyzed after 1 hour	% retention
8	87.5		61	69.7
9	140	122	99	70.7
10	350	336	241	68.9



Results (5A) - Retention of Ascorbic acid in the pellets after submersion in water

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

Results (5B) - Retention of Ascorbic acid in the pellets after submersion in water





Conclusions (1)

- Coating pellets with fish oil dramatically decreases the leaching of material from the pellet.
- 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



Conclusions (2)

- Ascorbic acid mixed with the other ingredients during the processing in the feedmill is retained by 70 % after submersion of the pellet in water, independently from its incorporation level
- Ascorbic acid sprayed on the outside of the pellets is retained by only 25-35 % after submersion of the pellet in water, independently from its incorporation level
- Coating of fish oil does not seem to improve the retention of ascorbic acid in the pellet.

- Adding Ascorbic acid by spraying is costly, not only in labor, but by its inefficiency to supply the AA to the prawns.
- It is better to work with a trusted partner to produce shrimp feeds in cooperation and/or according to your requirements, rather than to try to improve the feeds on the farm.





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