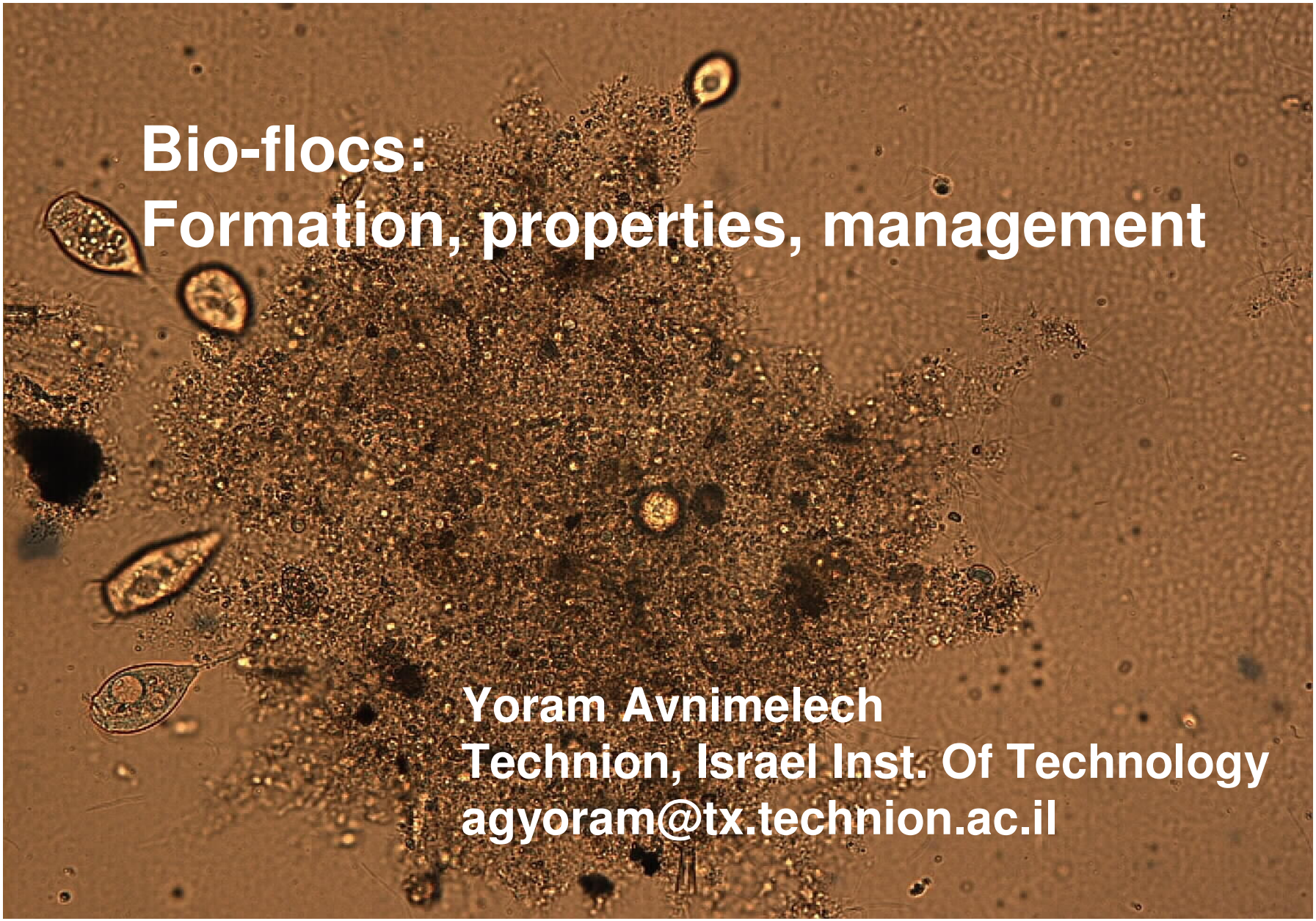

Bio-flocs: Formation, properties, management

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Control of Water Quality

- We know how to use heterotrophic bacteria to control water quality:
- With zero or limited water exchange we get dense population.
- Aeration and mixing provide excellent conditions for microbial activity and metabolism of organic wastes.
- By using C/N control, we can easily, consistently and quantitatively reduce concentrations of ammonia and nitrite in the water.

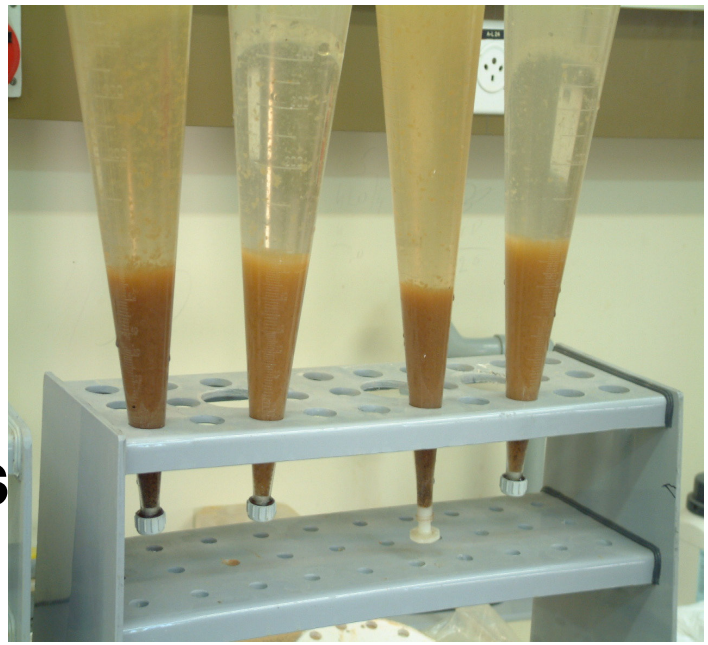
Feeding with Bacteria

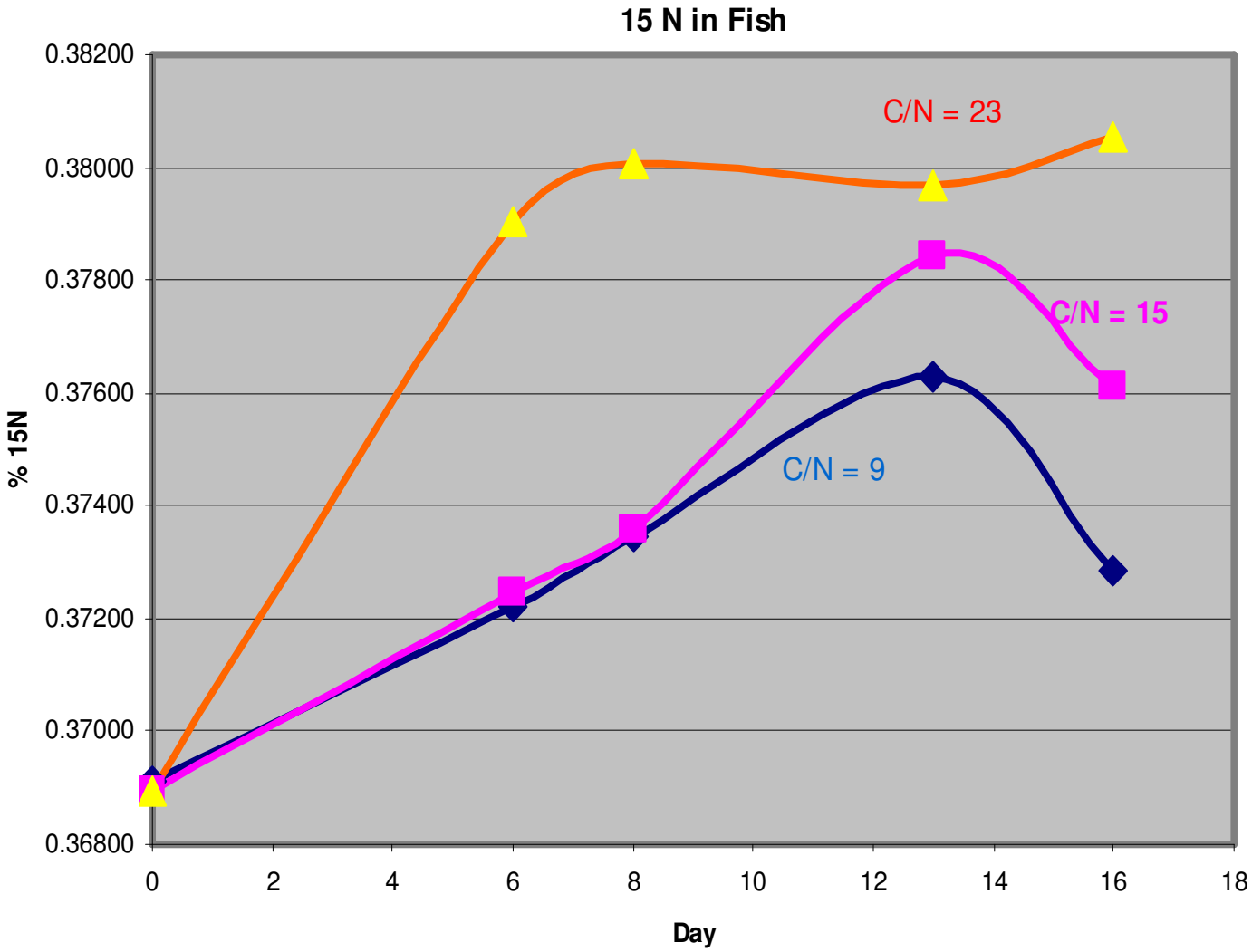
- Shrimp and fish (tilapia, other) can harvest the bacteria and essentially, double protein utilization.
- However, harvest efficiency depends on presence of flocs and seems to improve with bio-flocs size.
- Bio-floc formation and properties are still empirical and un-predictable.

The development and properties of microbial flocs is of prime importance as to the feeding efficiency of bio-flocs ponds. Moreover, the ability to control these parameters is critical to the success of shrimp or fish production in BFT systems.

Typically, ponds start as green
autotrophic systems
only later on in the season
Microbial community develops,
the pond turns brown
and flocs become visible
This sequence is empirical
and as yet, no guidelines
toward the optimal management
of microbial flocs is available.

The goal of the present work is
To develop the needed control
Technology toward an optimal
Bio-flocs development.





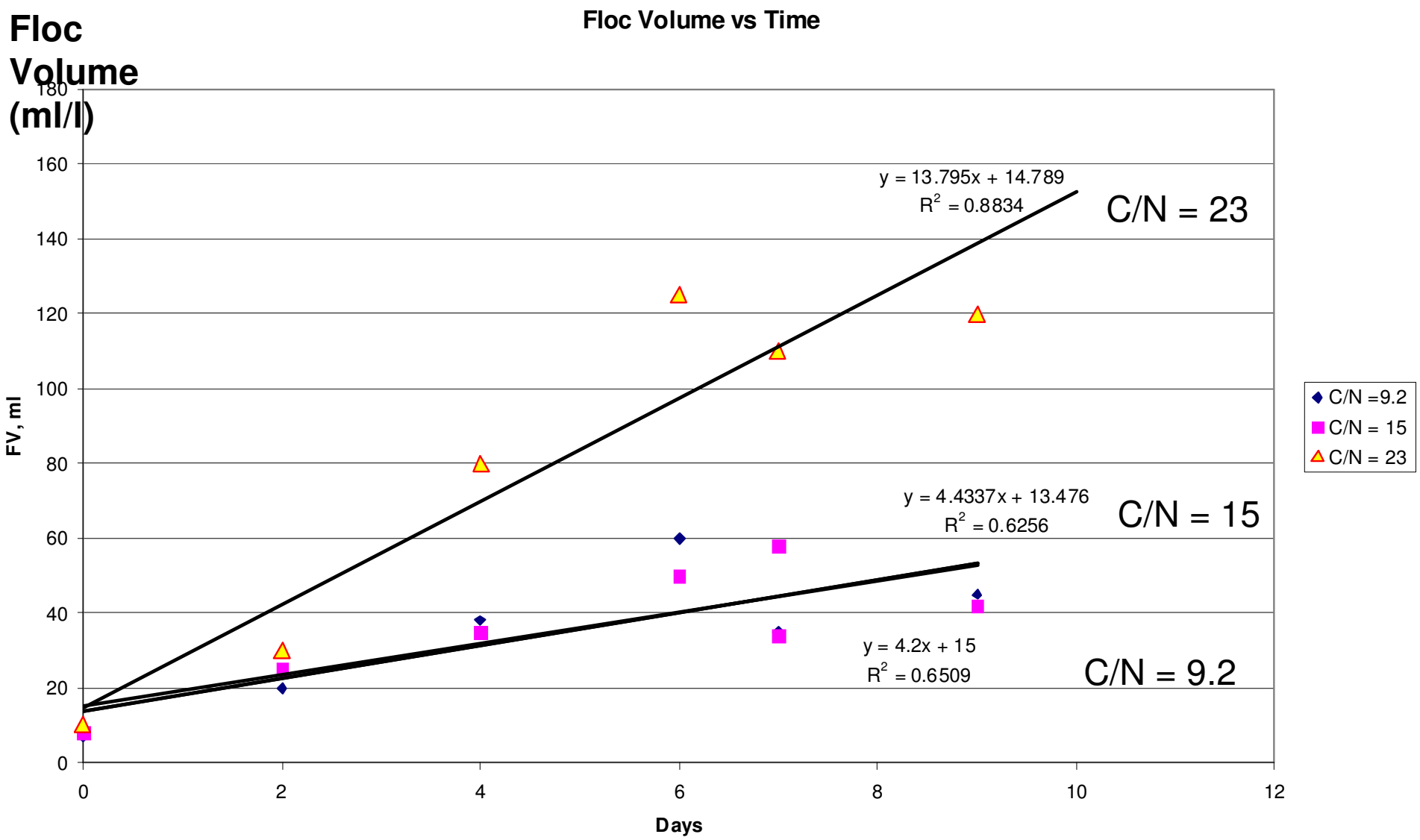
More efficient uptake in C/N = 23

Steady state (uptake = excretion) with time

Uptake of protein from flocs, using 15N tagging, Dor, Israel, 2005

C/N	TSS, mg/l	15N in fish (*)	Daily N Uptake mg/kg fish	Daily protein uptake mg/kg	Specific uptake (**)
9.2	**441**	0.3722	28.0	**180**	0.063
15	**450**	0.3725	29.2	**188**	0.065
23	484	0.379	52.4	**338**	0.108

*15N(t=0) 0.3689 ** Daily N Uptake/TSS



Higher floc volume (same TSS) in C/N =23


Uptake = K * Suspended Solids
K = Specific uptake

Uptake of protein from flocs, using 15N tagging, Dor, Israel, 2005

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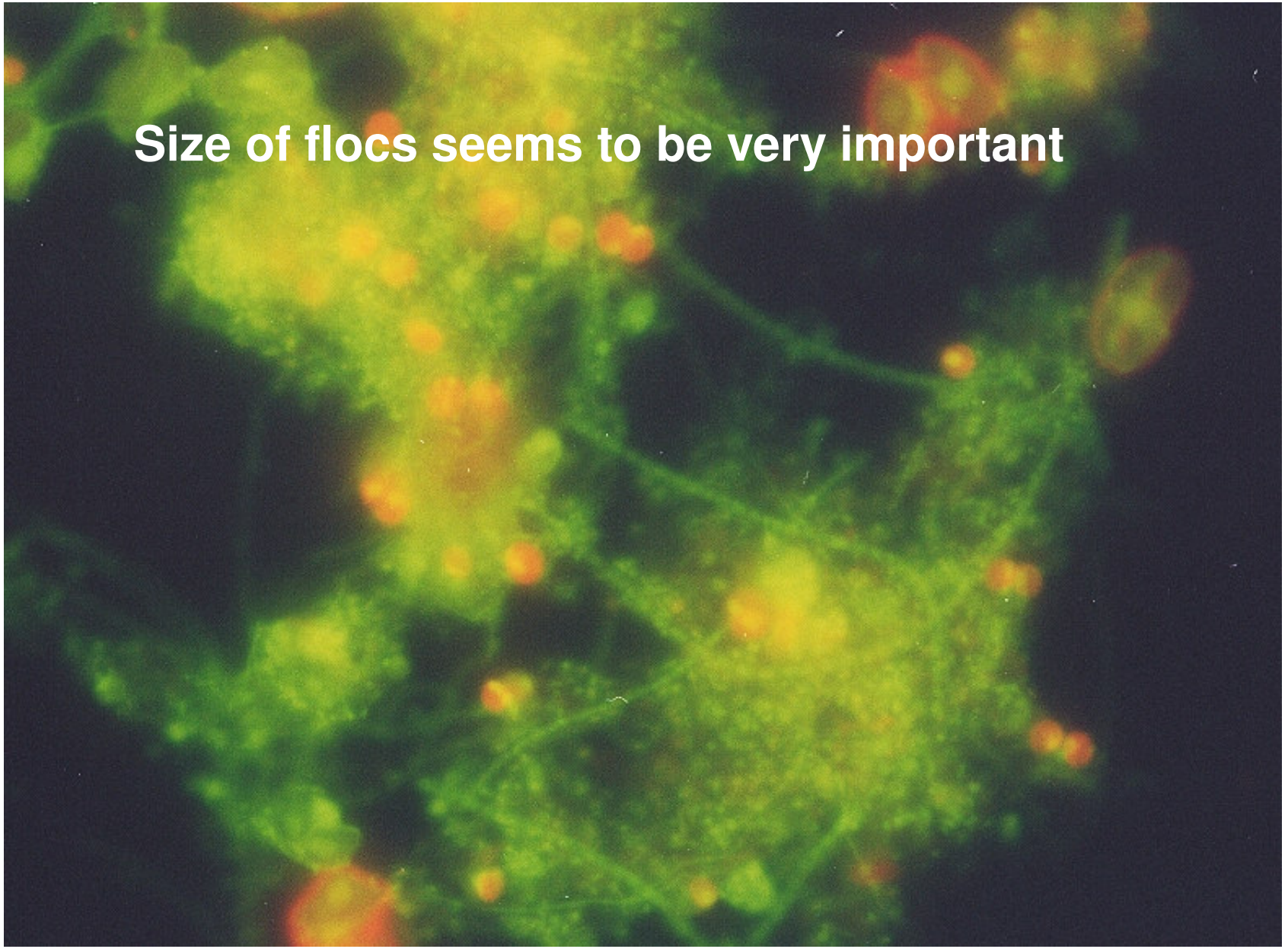
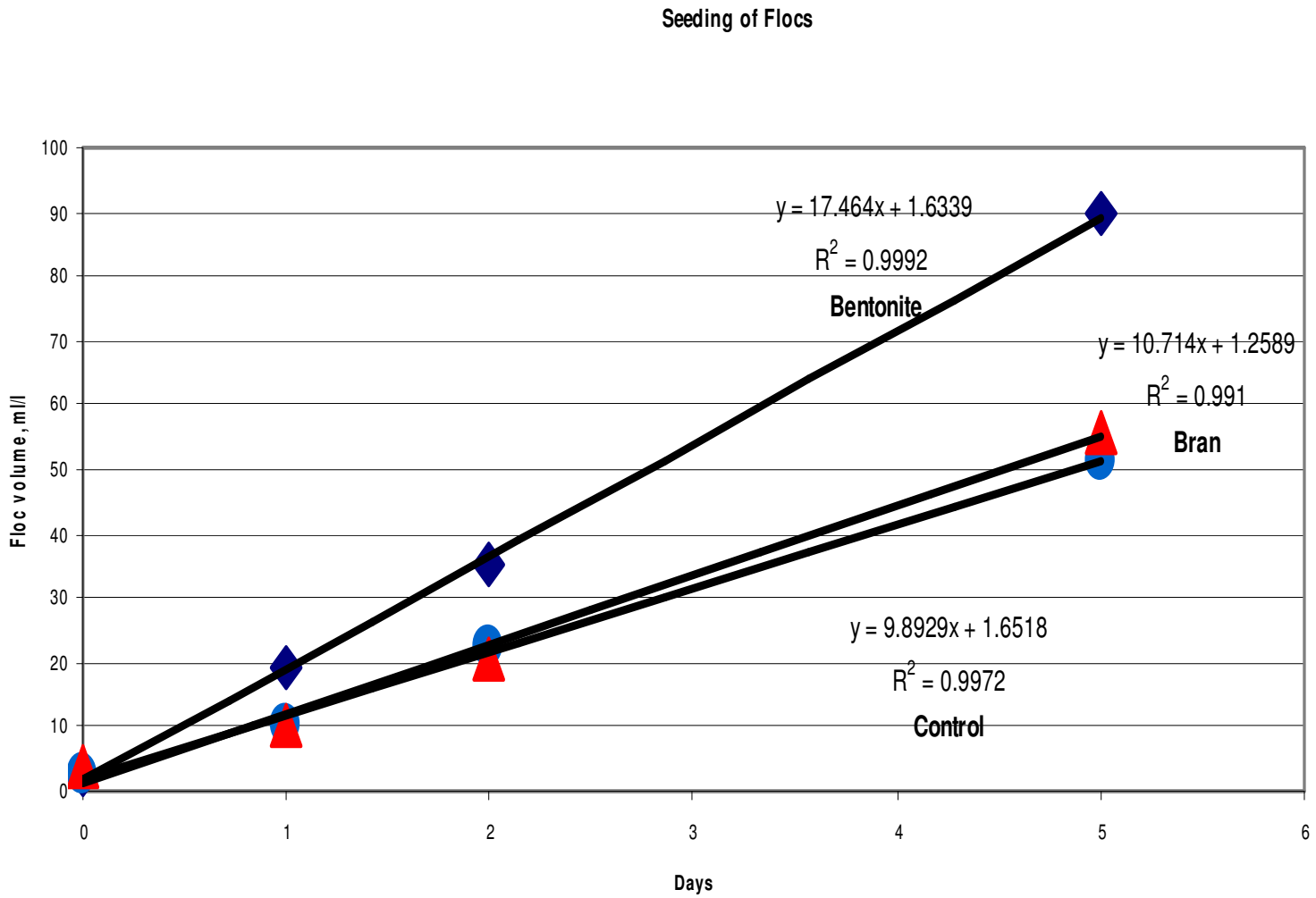
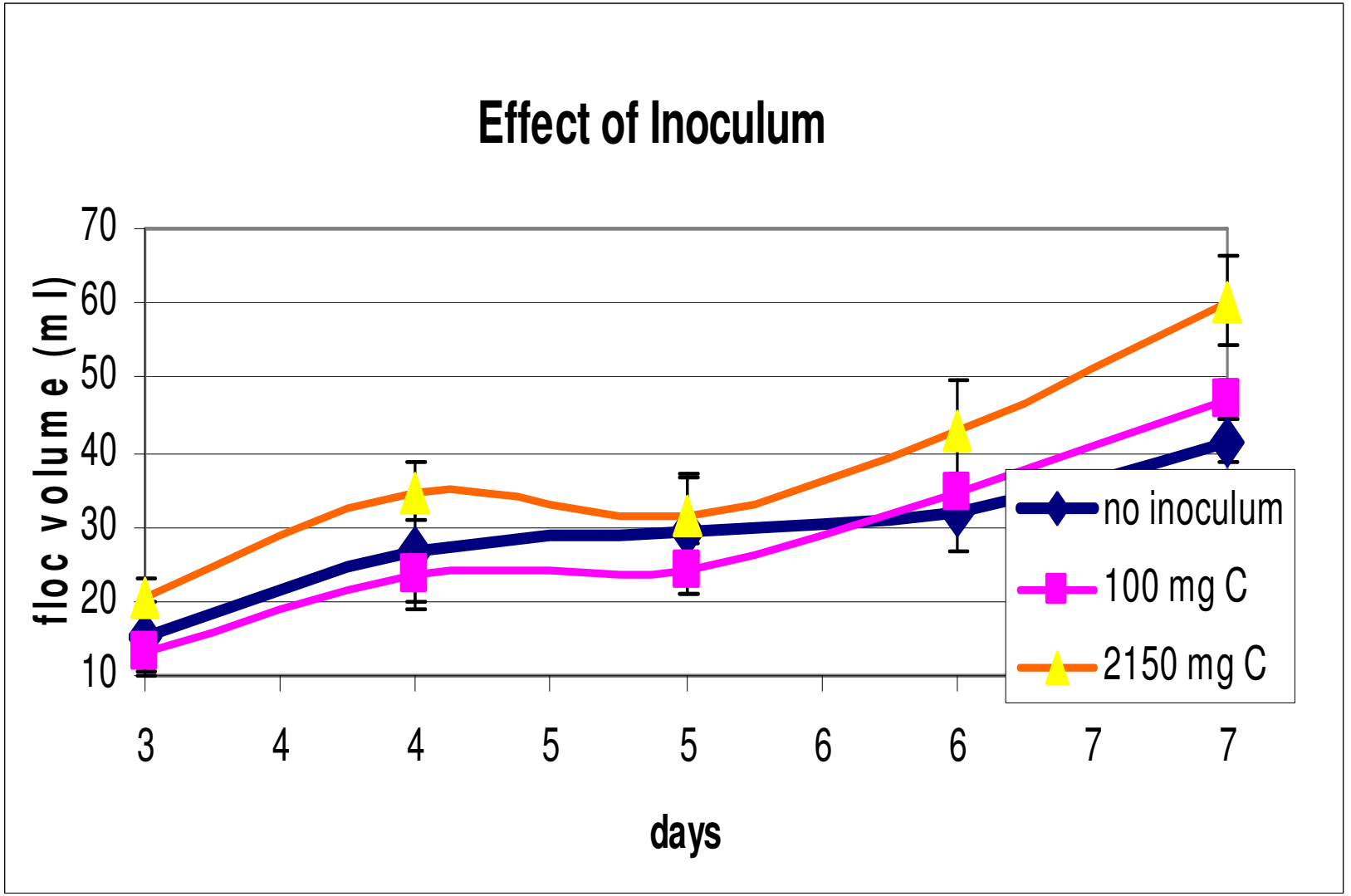


Courtesy of Dr Michelle Burford

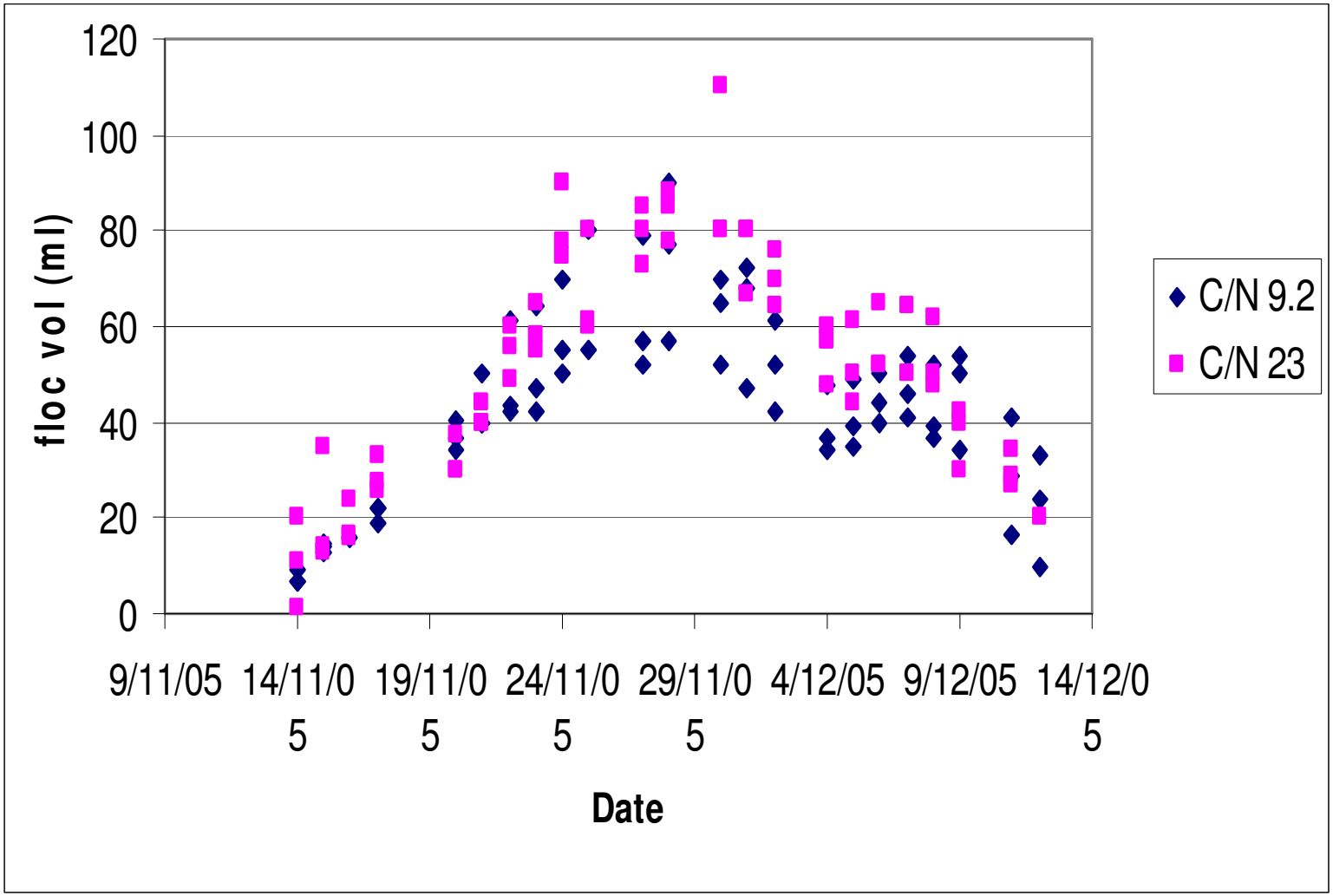
Clay (mud) addition may help bio-flocs formation



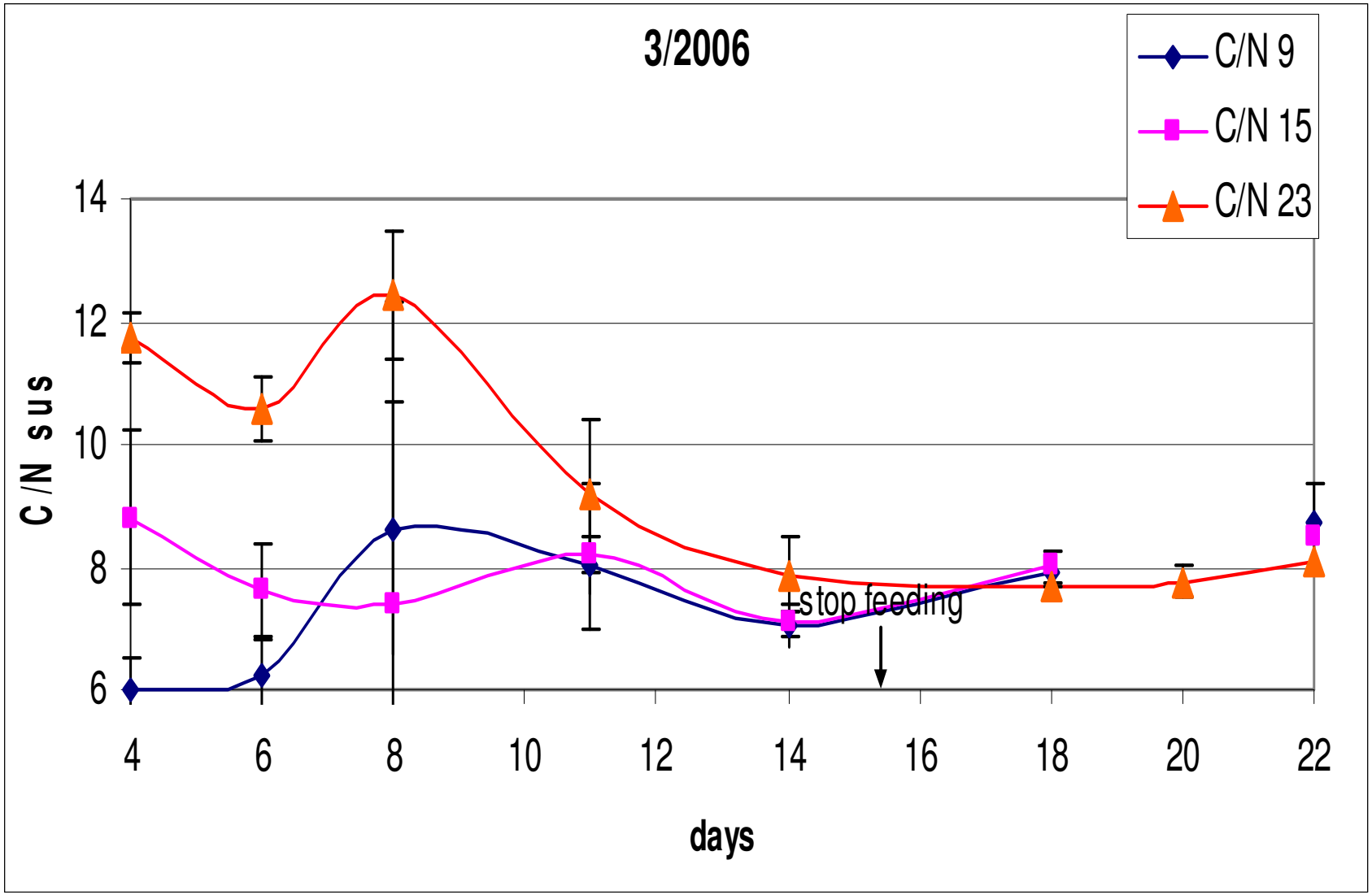
Adding suitable inoculum may help to form bio-flocs, possibly large ones



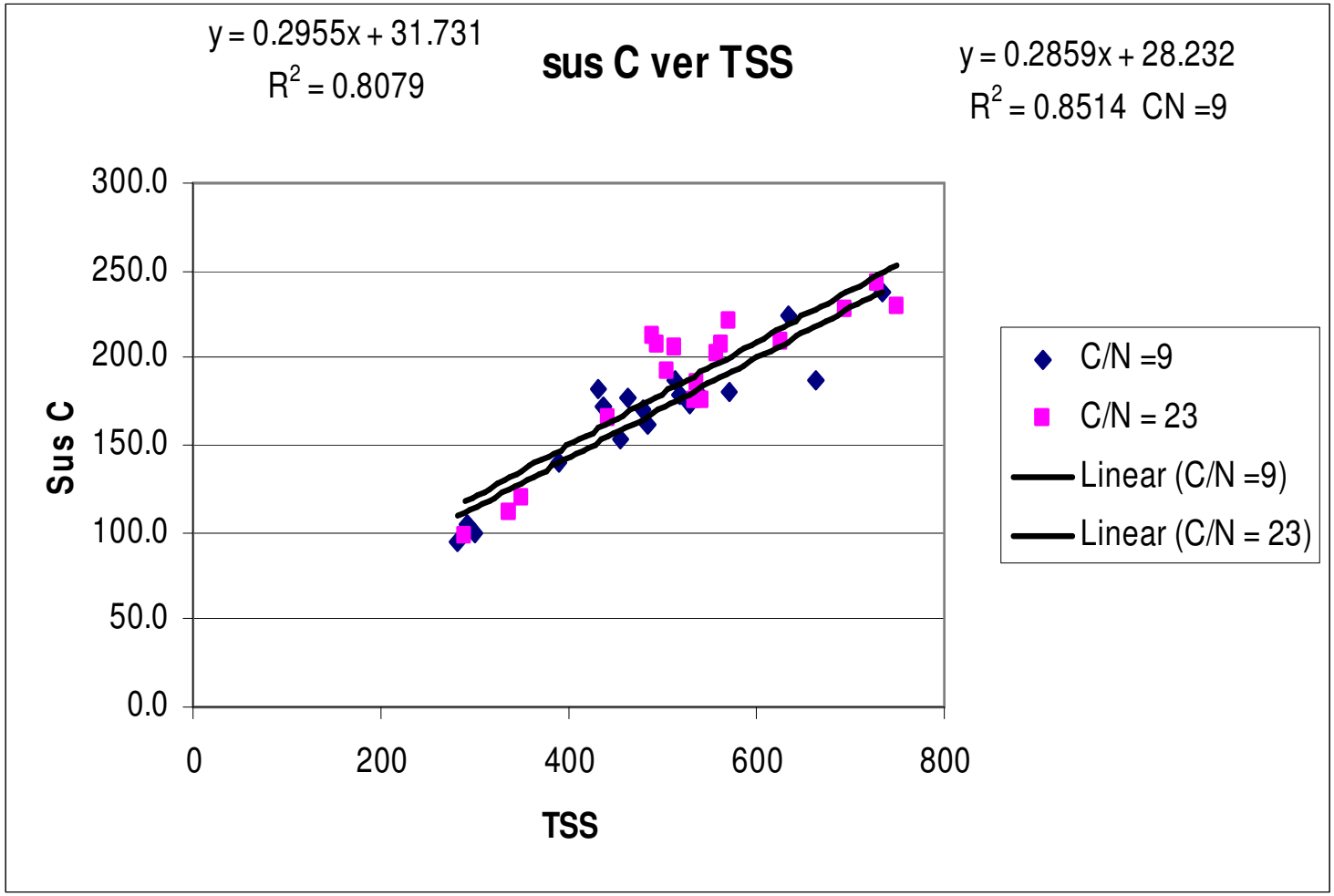
High C/N seems to enhance larger flocs



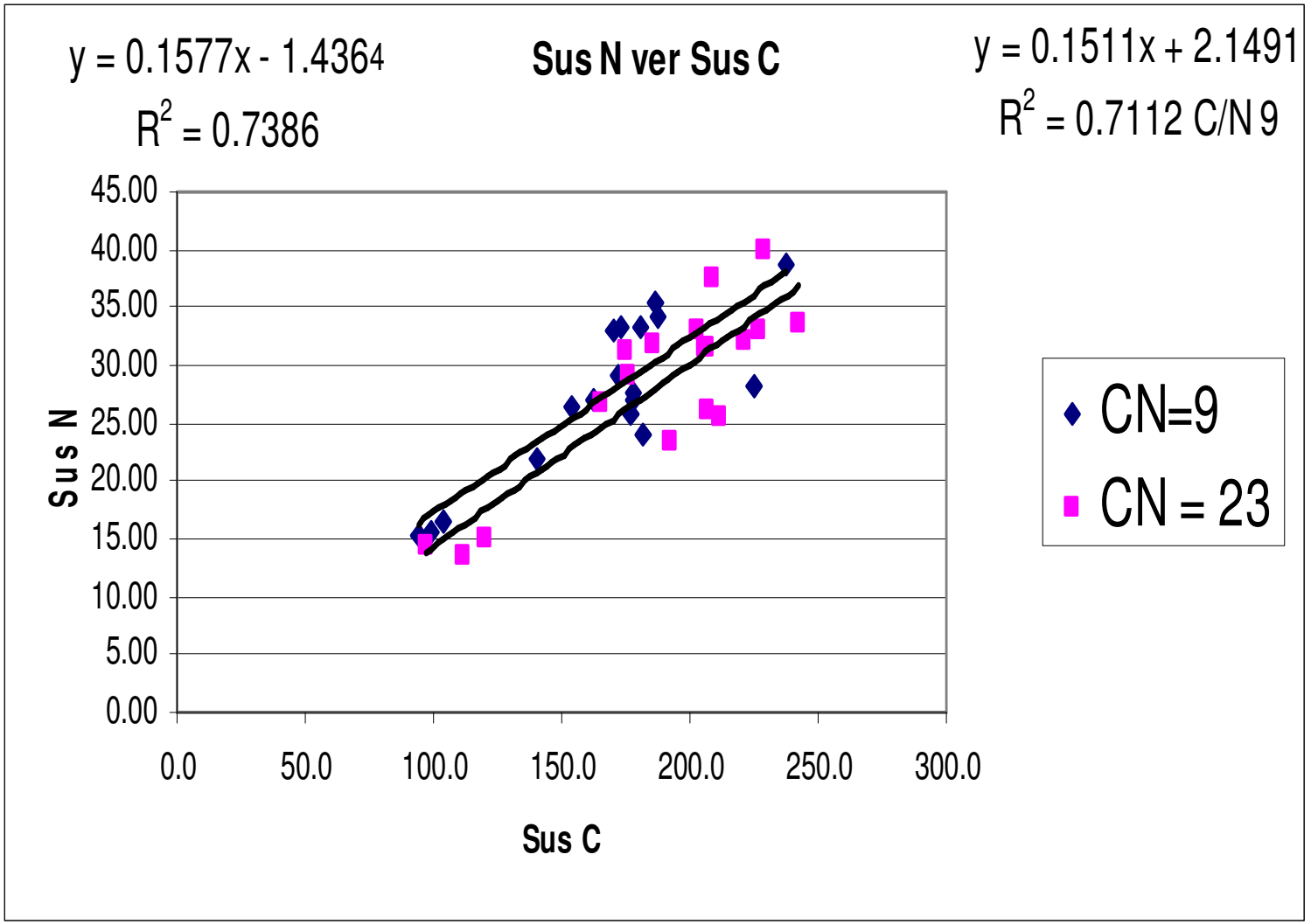
C/N ratio may affect floc composition in the beginning.
***Possibly*, later, a steady- state composition is achieved**



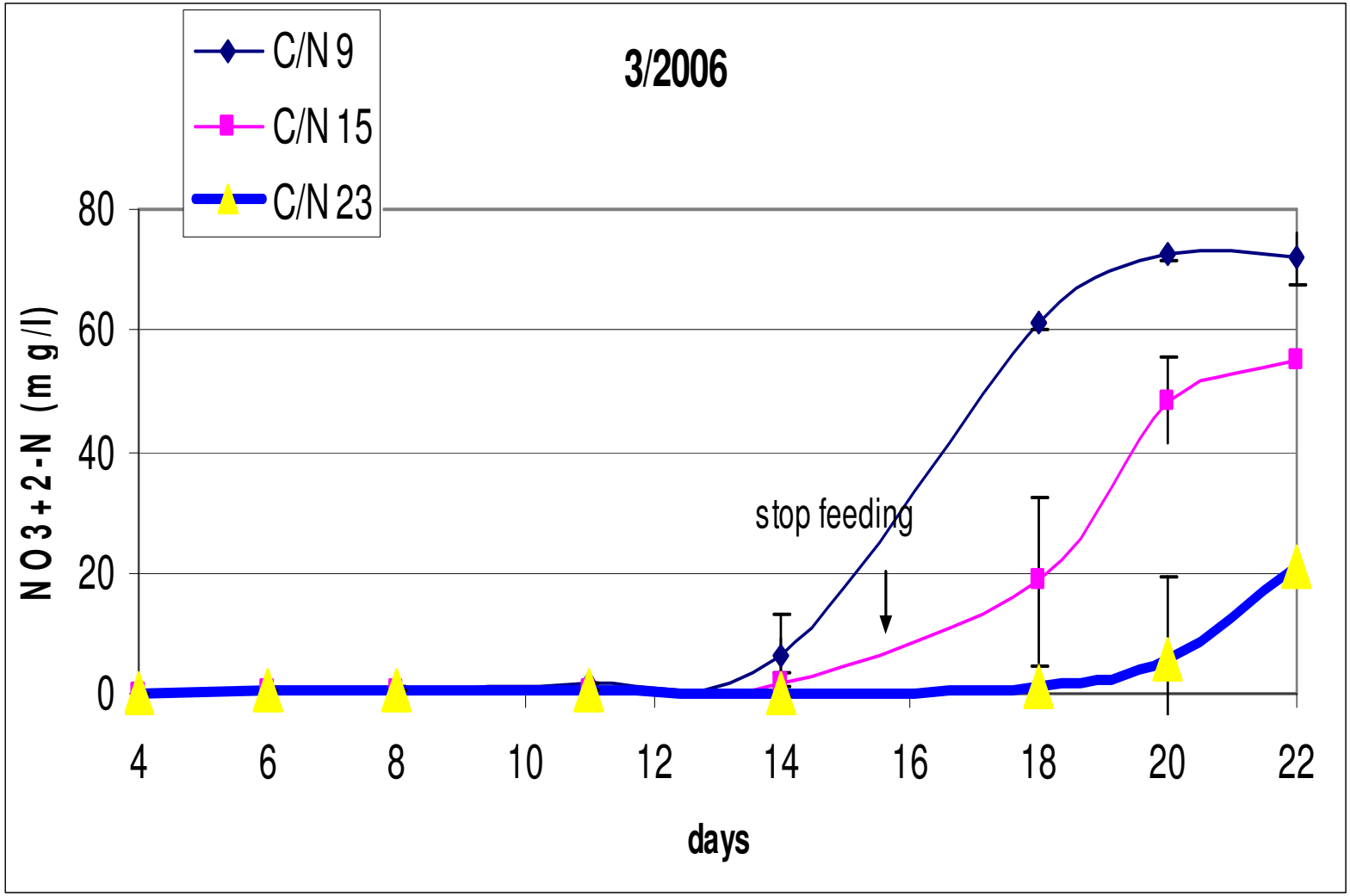
Carbon percentage in the suspended bio-flocs was nor affected By the feed C/N ratio. On the average, 29% organic C



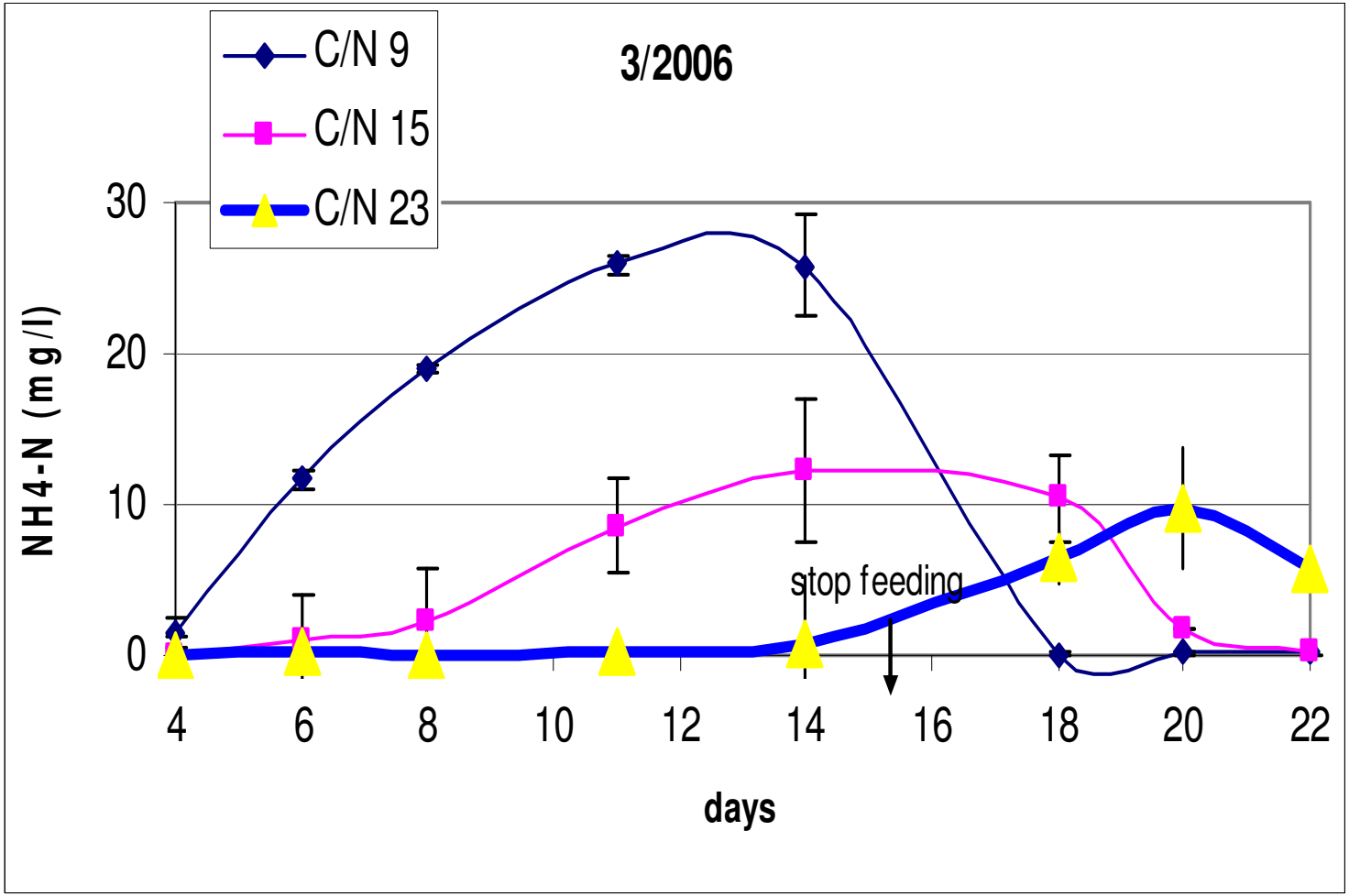
C/N in flocs not depended on C/N in feed



So, where is the nitrogen???


C/N 9
C/N 15
C/N 23
3/2006
NO3+2-N (mg/l)
80
60
40
20
0
4
6
8
10
12
14
16
18
20
22
stop feeding
days

In case of C/N = 23 ALL N is used to generate microbial protein
With lower C/N in feed, excessive N is released



Some conclusions

- 1. We need to learn more on bio-flocs control. We present here preliminary results.
- 2. C/N, seeding with clay, inoculum, all affect floc formation and properties.
- 3. It seems, that regardless of C/N in feed, bio-flocs composition approaches a steady composition.

Thanks

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