

CYANOCOST – ES 1105 Action

Cyanobacterial blooms and toxins in water resources: Occurrence, impacts and management.

Short Term Scientific Mission (STSM) Can the akinets survive to digestion of *Daphnia magna* Straus, 1920?

Objectives

During sedimentation, part of the annual life cycle of Nostoc group, the filaments fragmentation and the akinets sedimentation offer an opportunity for zooplankton to grazing. This STSM aims to test the akinets resistance against digestion of a cladocera organism: *Daphnia magna* Straus, 1920.

Methodology

We extract akinets from the sediment surface of Aydat lake and Cournon pond (eutrophic waters located in Auvergne area, France) with LUDOX®. The samples were taken in Decembre of 2014 and in Novembre of 2015 respectively.

Anabaena macrospora and *Anabaena flos-aquae* akinets (Fig. 1) are present in Aydat lake and *Cylindrospermopsis* and *Aphanizomenon* akinets (Fig. 2) are presents in Cournon pond.

The experimental development (Fig. 3) was performed twice simultaneously. In order to validate the experiment we used fluorescent balls because these balls go through gastrointestinal tract of *D. magna* without any alteration. Also, we used *Chlamydomonas* because it serves as a catalyst, stimulating the filtering activity of *D. magna*.

The count was performed under an epifluorescent microscope. We used SYTOX® to distinguish intact akinets (fluoresce in red under green light (560nm), and empty akinets (fluoresce in yellow under blue light (488 nm)).

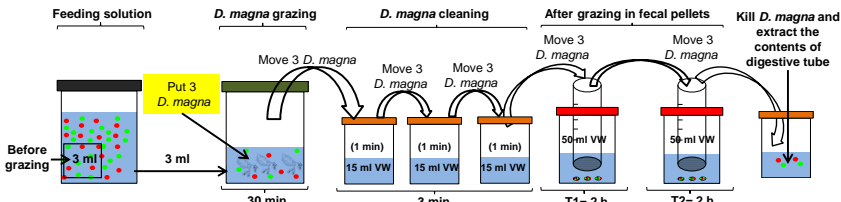


Figure 3. Schematic design of the experiment. (Feeding solution composition: 10 ml akinets (red balls) + 1 ml fluorescent balls (green balls) + 0.3 ml *Chlamydomonas* + 14 ml Volvic Water (VW)). We used 3 replicates in each experiment.

Results

The comparison of fluorescent balls number at the beginning and at the end of the experiment showed no significant difference (Mann-Whitney U; Z=4, p=0.83). This result validates the experiment.

The number of intact akinets we found in fecal pellets is very low (1 ± 0.58 for *A. macrospora* akinets, 0.33 ± 0.33 for *A. flos-aquae* and 0 for *Cylindrospermopsis* and *Aphanizomenon* akinets) (Fig. 4).

The percentage of the number of fluorescent balls and intact akinets that *D. magna* ingested is low (Table 1). This can be the reason of percentage of intact akinets we recovered in fecal pellets is low too (Table 1).

Highlights

The grazing impact on akinets could be considered high because almost all akinets which were ingested were digested. However, if we consider the percentage ingested, the impact on natural akinets could be not significative.

Table 1. Percentage of total fluorescent balls and total intact akinets ingested and digested by *D. magna* and percentage recovered in fecal pellets.

		% ingested	% digested	% recovered
Aydat lake	Fluorescent balls	7.19	0.70	6.49
	<i>A. macrospora</i>	53.75	53.56	0.19
Cournon pond	<i>A. flos-aquae</i>	46.03	45.9	0.13
	Fluorescent balls	7.90	4.88	3.02
Aydat lake	<i>Cylindrospermopsis</i>	31.58	31.58	0.00
	<i>Aphanizomenon</i>	28.52	28.52	0.00

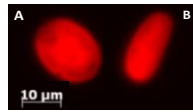


Figure 1. *A. macrospora* (A) *A. flos-aquae* (B) akinets.

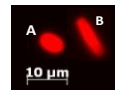


Figure 2. *Cylindrospermopsis* (A) and *Aphanizomenon* (B) akinets.

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Researcher

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She has a degree in Biological Sciences (2010), a Master's Degree in Environment and Natural Resources (2011) and Ph. D. on methods of controlling cyanobacteria entitled "Treatment of inhibition of cyanobacterial blooms in controlled conditions using limnocoralls" (2015). Since 2010 she joined in research group of EHEC. She has participated in a research project framed in the field of Hydrobiology and Limnology, she is the author of eight publications including books, book chapters and articles in scientific journals, and has presented 47 communications in national and international conferences.

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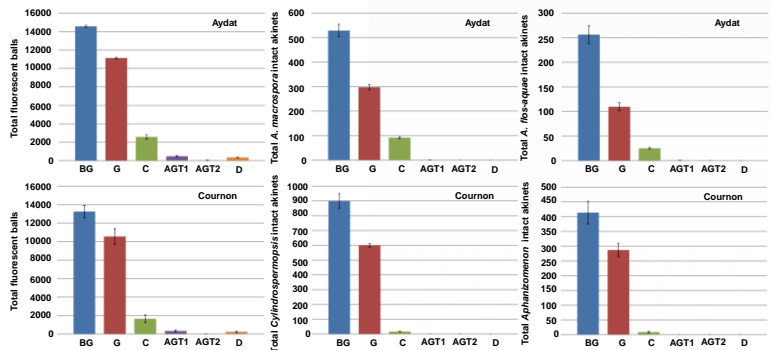


Figure 4. Mean and standard error of total fluorescent balls and total intact akinets from Aydat lake and from Cournon pond were counted in all steps experimental development. (BG = before grazing; G = after grazing; C = cleaning; AG = after grazing in fecal pellets T1 = 2h and T2 = 2 h; D = content of digestive tube of *D. magna*).



COST is supported by the EU RTD Framework Programme



ESF provides the COST Office through a European Commission contract