



BIOLOGICAL TREATMENT OF  
IRRIGATION PONDS FOR ALGAE CONTROL

**MicroCat-AL-N+**

# I. BACKGROUND INFORMATION

## 1. Problem Description

Over the past 40 years, Chile has become a major producer in the forestry and agricultural sectors, rapidly increasing production and exports, currently ranking as a global leader in many of these products.

This reality, combined with the drastic effects of climate change (violent natural phenomena and a trend toward decreasing precipitation), has led to increased concerns over water use, a resource that is becoming increasingly scarce.

As a result, high production levels and reduced rainfall have forced regions that previously relied on natural precipitation to shift from traditional surface irrigation to sophisticated water accumulation, filtration, and distribution systems.

However, this increased technological advancement not only raises costs but also introduces previously non-existent problems. One of the most significant issues affecting productivity is the clogging of irrigation systems. Failure to detect these blockages in time can even lead to tree mortality, directly impacting the sector's profitability.

Clogging in irrigation systems, including filters and drippers, is caused by the deteriorating quality of water, which carries large amounts of chemical and organic waste, soil, etc. Combined with high solar radiation during the summer, this leads to rapid eutrophication, exponentially increasing the presence of both large (string) algae and microalgae. These algae ultimately clog filters and drippers, requiring increased labor for cleaning. Since blocked drippers often go unnoticed, production is negatively affected.

Eutrophication of irrigation ponds is becoming more frequent and intense, affecting areas where this phenomenon was previously rare or insignificant.

The species of algae that develop in ponds vary depending on the region, the type and origin of the water, the contaminants present, etc., creating different problems in each case.

Due to the vast number of algae species, they can be classified into two major groups based on their impact on irrigation systems. Microalgae primarily clog filters and drippers, while macroalgae generally obstruct pump inlets.

QM Environmental International B.V. was asked to develop a microbial formulation capable of reducing both algae types. This formulation was presented under the name **MicroCat-AL-N+**.

## 2. Objective of the Biological Treatment

The purpose of the biological treatment is to reduce the presence of these algae in the environment, thereby minimizing their negative effects.

For ornamental ponds, algae proliferation can be controlled purely for aesthetic purposes.

## 3. Methodology

Ideally, biological treatment should begin one month before irrigation use to establish a sufficient biomass, preferably free of algae. Once algae die and decompose, they release nutrients that fuel the next generation of algae. These, combined with nutrients from the pond's inflow, make control more challenging.

Starting treatment with a clean pond is not always possible, as certain conditions may prevent cleaning, such as the pond's structure or the urgency of addressing eutrophication during the irrigation season, making draining and cleaning impossible.

To determine the appropriate dosage, the following parameters must be considered: inflow water quality, type of algae present in the pond, pond volume, irrigation volume, water residence time, filter type, dripper type, and pond lining.

For successful treatment, it is essential to monitor variations in these parameters over time to adjust the treatment accordingly.

Once this information is obtained, the dosage and application frequency are calculated, ranging from daily to weekly, biweekly, or monthly. Field experience indicates that shorter intervals between applications are more effective.

The product is applied manually using water-soluble bags, typically 250 grams each, ensuring uniform distribution throughout the pond.





This application method allows for quick and efficient treatment without requiring additional equipment while ensuring complete coverage.

The region where these biological treatments have been conducted has a Mediterranean continental climate with an extended dry season in the summer. This is characteristic of Chile’s central valley and intermediate depression, with summer temperatures reaching up to 35°C and winter temperatures occasionally dropping below 0°C.

## 4. Case Studies

### 4.1 Case Study N°1

#### A. Pond

- Crops: Cherimoya, papaya, lemons, and lucuma
- Lining: Geomembrane

Surface Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Water Source	Irrigated Volume (m <sup>3</sup> /month)	Retention (days)	Lining
1,250	2,500	Well	36,400	2	Geomembrane

During the peak irrigation season, the pond was left untreated, leading to excessive algae growth that clogged filters and drippers.



### **B Dosage**

Due to low water retention, and after removing floating algae, a high dose of 3.75 kg of **MicroCat-AL-N+** was applied twice weekly, equivalent to 0.82 g/m<sup>3</sup> of irrigated water.

### **C Treatment Results**

After cleaning and applying the recommended doses, the pond remained in perfect condition, resolving the severe clogging issue.



## 4.2 Case Study N°2

Surface Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Water Source	Irrigated Volume (m <sup>3</sup> /month)	Retention (days)	Lining
4,000	10,000	Well	8,400	36	Geomembrane

### A. Identified Problem

This pond was received in a clean state as it had already been treated the previous season. The objective was to maintain it in the same condition, preventing algae growth throughout the entire season.

### B. Dosage

A monthly dose of 10 kg of **MicroCat-AL-N+** was applied in a single treatment using 250 g water-soluble bags, equivalent to 1.0 g/m<sup>3</sup> of irrigated water. This dosage was chosen due to the pond's remote location and the difficulty of accessing it.

### C. Treatment Results

The pond remained clean throughout the irrigation period, with no algae accumulation.





### 4.3 Case Study N°3

#### A. Pond

- Irrigated Area: 60 hectares
- Crops: Citrus, avocado
- Lining: Geomembrane

Name	Location	Surface Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Water Source	Irrigated Volume (m <sup>3</sup> /month)	Retention (days)	Lining
N°1	-32.418, -70.926	12,000	45,000	Well	-	-	Geomembrane
N°2	-32.415, -70.921	12,000	45,000	Pond N°1	-	-	Geomembrane
No. 3	-32.427, -70.916	1,300	3,180	Pond N°2	90,000	31	Geomembrane



Water from Pond N°1 is transferred entirely to Pond N°2 , which then pumps all its water to Pond N°3, which also receives direct input from various wells.

#### B. Identified Problem

The goal was to keep the larger ponds algae-free to prevent algae accumulation in Pond No. 4, which houses the irrigation system.

#### C. Dosage

The entire irrigation system was treated as a single unit.

- Pond N°1: 20 kg/month of **MicroCat-AL-N+**
- Pond No. 3: 10 kg/month (for water sourced directly from wells)

Total dosage applied: 0.33 g/m<sup>3</sup> of irrigated water.

#### D. Treatment Results

By the end of the irrigation season, the ponds remained in optimal condition, preventing clogging issues.



Pond 1



Pond 2



Pond 3

## 4.4 Case Study N°4

### A. Pond

Surface Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Water Source	Irrigated Volume (m <sup>3</sup> /month)	Retention (days)	Lining
3,000	10,000	Well	73,000	4.1	Geomembrane

This pond is filled with well water and irrigates 50 hectares with 425,000 m<sup>3</sup> of water, of which 219,000 m<sup>3</sup> are used between January and March.



### B. Identified Problem

Biological treatment began at the start of the season, meaning there was no time for cleaning, and the pond was received completely covered in algae. The goal of the treatment was not to eliminate existing algae, but rather to prevent further deterioration and minimize clogging of drippers and filters.

### C. Dosage

Since the main issue was avoiding dripper clogging—which is caused by microalgae—rather than addressing large algae (which did not pose a problem due to the pond's structure and the positioning of the pump intakes), a monthly dose of 10 kg of **MicroCat-AL-N+** was applied in a single treatment, equivalent to 0.15 g/m<sup>3</sup> of irrigated water.

### D. Treatment Results

With the specified dosage, the water remained almost completely free of microalgae, significantly reducing clogging issues, which was evident in the improved water clarity.



## 4.5 Case Study N°5

### A. Pond

- Crops: Wine grapes (Viña Vinifera), walnut trees
- Lining: Geomembrane

Surface Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Water Source	Irrigated Volume (m <sup>3</sup> /month)	Retention (days)	Lining
10,000	20,000	Spring	27,000	22	Soil

### B. Identified Problem

This pond receives crystal-clear spring water, making it highly transparent and particularly susceptible to rapid algae invasion. Although the water is low in contaminants, the surrounding vegetation contributes enough organic matter to promote algae growth.

### C. Dosage

Due to its high susceptibility to algae formation, a monthly dose of 20 kg of **MicroCat-AL-N+** was applied, equivalent to 0.74 g/m<sup>3</sup> of irrigated water.

### D. Treatment Results

The pond remained in the same condition throughout the season, without an increase in algae growth.

After 80 days of biological treatment, a brief filter clogging incident occurred due to internal residues being flushed from the pipes. However, this situation had been anticipated and did not cause major issues.





## 4.6 Case Study N°6

### A. Pond

- Crops: Export table grapes
- Lining: Geomembrane

Surface Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Water Source	Irrigated Volume (m <sup>3</sup> /month)	Retention (days)	Lining
6,000	16,000	River / Well	90,600	5	Geomembrane

### B. Identified Problem

The goal was to maintain the pond in optimal condition throughout the entire eight-month irrigation season, preventing filter and dripper clogging.

### C. Dosage

Given the condition of the pond at the start of treatment, a weekly dose of 12 kg was applied, equivalent to 0.52 g/m<sup>3</sup> of irrigated water.

### D. Treatment Results

The pond remained free of algae throughout the treatment period, and a reduction in accumulated sediments along the pond's slopes was observed.



## 4.7 Case Study N°7

### A.Pond

- Irrigated Area: 80 hectares
- Crops: Export table grapes
- Lining: Geomembrane

Pond	Surface Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Water Source	Irrigated Volume (m <sup>3</sup> /month)	Retention (days)	Lining
Pond N°1	12,370	48,000	River	-	-	Geomembrane
Pond N°2	15,600	48,000	River	-	-	Geomembrane
Pond N°3	650	500	Ponds No. 1 & 2, Well	55,500	52	Geomembrane



### **B. Initial Problem Identified**

Ponds N°1 and N°2, along with several wells, supply the Pond N°3. The long retention time in these ponds promotes algae growth, requiring treatment of the three ponds as a single unit.

At the end of the season, the two larger ponds are emptied, and only the San Juan Pond is used for smaller irrigation volumes.

Due to scheduling and decreased irrigation volume, the company decided to stop biological treatment in February, even though the summer season had not yet ended. Up until that point, no filter or dripper clogging issues had been observed, and the water remained clear and algae-free.

### **C. Dosage**

During the treatment period, an average dosage of 0.63 g/m<sup>3</sup> of irrigated water was applied.

### **D. Secondary Problem**

After biological treatment was stopped in February, no product was applied in March, leading to a sudden algae outbreak.





### E. Emergency Dosage

Given the rapid deterioration of the pond after stopping biological treatment, it was decided to resume treatment, remove floating algae, and apply a higher dosage than the regular treatment. A dose of 1.6 g/m<sup>3</sup> of irrigated water was used until the end of the irrigation season, effectively resolving the emergency.

## 4.8 Case Study N°8

### A. Pond

- Crops: Wine grapes
- Lining: None

Surface Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Water Source	Irrigated Volume (m <sup>3</sup> /month)	Retention (days)	Lining
17,150	41,000	Well	35,200	35	Soil

### B. Identified Problem

The pond's natural environment and lack of lining made algae proliferation a constant issue, leading to frequent clogging of filters and drippers.

### C. Dosage

A dosage of 0.85 g/m<sup>3</sup> of irrigated water was applied.

### D. Treatment Results

The clogging issue was completely resolved until the end of the irrigation season.



## 4.9 Case Study N°9

### A.pond

- Crops: Native plant nursery
- Lining: Geomembrane

Surface Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Water Source	Irrigated Volume (m <sup>3</sup> /month)	Retention (days)	Lining
80	15	Well	450	1	Geomembrane

### B. Identified Problem

Since uninterrupted irrigation is essential for the growth of native plant species, filters and drippers must never become clogged.

### C. Dosage

Due to the high water turnover rate, which limits the effective action time of **MicroCat-AL-N+**, a dosage of 2.2 g/m<sup>3</sup> of irrigated water was applied.

## 5. CONCLUSIONS

Biological treatment using **MicroCat-AL-N+** has proven effective in controlling algae and microalgae that clog filters and drippers.

In general, the recommended dosage is around 0.7 g/m<sup>3</sup> of irrigated water. However, as each case varies in terms of pond conditions, algae type, water volume, retention time, inflow quality, lining, surrounding environment, temperature, and solar exposure, the dosage must be adjusted accordingly.

Additionally, these parameters change throughout the irrigation season, requiring continuous monitoring to adapt the treatment as needed.