

# **SLUG APPLICATION METHOD FOR FLOWING IRRIGATION CANALS WITH NO FUNCTIONING POTABLE WATER INTAKES**

## General Information

### PRODUCT INFORMATION

Captain is a chelated copper formulation that is effective in controlling a broad range of green and blue-green (cyanobacteria) algae, including filamentous, planktonic and macrophytic. Captain is also an effective herbicide on submersed weed species with susceptibility to copper. The ethanolamines in Captain reduce the precipitation of copper with carbonates and bicarbonates in the water. Use the lower concentrations/rates in softer water (<50 ppm alkalinity) or when treating species with greater susceptibility to Captain; use higher concentrations/rates in harder water (>50 ppm alkalinity) and when treating heavier infestations and/or less susceptible species.

### Treatment Notes

Performance of Captain is enhanced under certain conditions. It is recommended to consult a SePRO Aquatic Specialist for guidance in implementing a treatment program to achieve optimal results. The following apply to the use of Captain to achieve optimum effectiveness:

- Treat when growth first begins to appear (if possible) or when target vegetation is actively growing.
- Apply in a manner that will ensure even distribution of Captain within the treatment area.
- Use a high-pressure surface spray application to break up dense floating algal mats.
- In heavily infested areas, a second application may be necessary. Retreat areas if regrowth begins to appear or if seasonal control is desired. Repeating application of Captain too soon after initial application may have no effect.

### Precautions and Restrictions

- Do not apply Captain directly to, or otherwise permit it to come into contact with

any desirable plants as injury may result.

- Do not apply in such a way that concentrated Captain comes in contact with crops, ornamentals, grass or other desirable plants.
- Wash spray equipment thoroughly before and after each application.
- Contents may cause bluing where marcite has been etched.

### Spray Drift Management

A variety of factors including weather conditions (e.g., wind direction, wind speed, temperature, relative humidity) and method of application (e.g., ground, aerial, airblast, chemigation) can influence pesticide drift. The applicator must evaluate all factors and make appropriate adjustments when applying this product.

### Droplet Size

Apply only as a medium or coarser spray (ASAE standard 572) or a volume mean diameter of 300 microns or greater for spinning atomizer nozzles.

### Wind Speed

Do not apply at wind speeds greater than 15 mph. Only apply this product if the wind direction favors on-target deposition (approximately 3 to 10 mph), and there are no sensitive areas within 250 feet downwind.

### Temperature Inversions

If applying at wind speeds less than 3 mph, the applicator must determine if a) conditions of temperature inversion exist, or b) stable atmospheric conditions exist at or below nozzle height. Do not make applications into areas of temperature inversions or stable atmospheric conditions.

### Other State and Local Requirements

Applicators must follow all state and local pesticide drift requirements regarding application of copper compounds. Where states have more stringent regulations, they must be observed.

### Equipment

All aerial and ground application equipment must be properly maintained and calibrated using appropriate carriers or surrogates.

Additional requirements for aerial applications:

- The boom length must not exceed 75% of the wingspan or 90% of the rotor blade diameter.
- Release spray at the lowest height consistent with efficacy and flight safety. Do not release spray at a height greater than 10 feet above the crop canopy unless a greater height is required for aircraft safety.
- When applications are made with a crosswind, the swath must be displaced downwind. The applicator must compensate for this displacement at the up and downwind edge of the application area by adjusting the path of the aircraft upwind.

Additional requirements for ground boom application:

Do not apply with a nozzle height greater than 4 feet above the crop canopy.

#### APPLICATION INFORMATION

For aquatic weed control (including algae and vascular plants), do not exceed a concentration of 1.0 ppm copper during any single application; wait a minimum of 14 days between retreatments. (When treating aquaculture ponds when fish are present, do not exceed a concentration of 0.4 ppm during any single application when targeting nuisance algae; wait a minimum of 10 days between treatments.)

#### Application Methods and Rates

##### Surface Spray/Injection Algaecide Application

For effective control, proper rates of Captain should be maintained for a minimum of three hours. The application concentrations/rates in Table 1 are based on static or minimal flow situations. Where significant dilution occurs from untreated waters or loss of water, within a three hour period, Captain may have to be metered in (refer to the Drip System or Metering Pump Application for Flowing Water Treatments section of this label).

Identify the algae growth present as one of the following types: planktonic (suspended), filamentous (matforming), or macrophytic algae (chara/nitella).

Determine the surface acreage (1 acre = 43,560 ft.<sup>2</sup>) and average depth of infested area.

### Drip System or Metering Pump Application for Flowing Water Treatments

For Use in Potable Water, Canals, Ditches, and Irrigation and Drainage Systems

For optimal control, apply Captain as soon as algae begin active growth or interfere noticeably with normal delivery of water (clogging of lateral headgates, suction screens, weed screens, and siphon tubes). Delaying treatment could perpetuate the problem causing massing and compacting of plants. Heavy infestations and low flow may cause poor distribution resulting in unsatisfactory control. Under these conditions repeated applications or increasing water flow rate during application may be necessary.

Prior to treatment it is important to accurately determine water flow rates. In the absence of weirs, orifices, or similar devices, which give accurate waterflow measurements, volume of flow can be estimated by the following formula:

Cubic feet per second (cfs) = average width (feet) x average depth (feet) x average velocity† (feet/second) x 0.9

† The velocity can be estimated by determining the length of time it takes a floating object to travel a defined distance. Divide the distance (feet) by the time (seconds) to estimate velocity (feet/seconds). This measure should be repeated 3 times at the intended application site and then calculate the average velocity.

After accurately determining the water flow rate in cfs or gallons/minute, find the corresponding Captain rate in Table 2 or use the below formula.

cfs x desired concentration of copper (ppm) = quarts/hour of application

Calculate the amount of Captain needed to maintain the drip rate for a treatment period of 3 hours by multiplying either:

Quarts / hr x 3; Milliliters / Minute x 180; or Fluid ounces / Minute x 180

Rates will target 1.0 ppm copper concentration in the treated water for the treatment period. Lower concentrations may be used on highly susceptible algae species or if longer exposure times are maintained. Introduction of the chemical

should be made in the channel at weirs or other turbulence-creating structures to promote the dispersion of the chemical. For injection periods longer than three hours (180 minutes), calculate the amount of Captain needed by multiplying the rate by the desired time in minutes or hours, as appropriate.

Use a drum or tank equipped with a valve or other volume control device that can be calibrated to maintain a constant drip rate. Use a stopwatch and appropriate measuring container to set the desired drip rate. Readjust accordingly if the canal flow rate changes during the treatment period. A small pump or other metering device may be used to meter Captain into the water more accurately. Application can be made using diluted or undiluted material.

Results can vary depending upon species and density of algae and vegetation, desired distance of control and flow rate, and impact of water quality on efficacy. Periodic maintenance treatments may be required to maintain seasonal control. It is recommended to consult a SePRO Aquatic Specialist to determine optimal use rate, location of treatment stations and treatment period under local conditions.

#### Chemigation System Application

Captain may be applied for the maintenance of chemigation systems. To control algae in chemigation systems Captain should be applied continuously during water application. For continuous addition application apply 0.91 - 9.1 gallons of Captain per 1,000,000 (one million) gallons of water (0.3 - 3.0 gallons of Captain per acrefoot of water). This will produce a concentration of 0.1 to 1.0 ppm of copper. Do not exceed 1.0 ppm of copper or 0.91 gallons of Captain per 100,000 gallons of water.

For additional guidance regarding specific calibrations or application techniques contact application equipment manufacturer, supplier, or pest control advisor. It is not necessary to agitate or dilute Captain in the supply tank before application to chemigation systems.

#### CHEMIGATION SYSTEM APPLICATION

- Apply Captain only through sprinkler and drip irrigation systems including: center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move; flood (basin), furrow, border or drip (trickle) systems.
- Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result

from non-uniform distribution of treated water.

- If you have questions about calibration, contact your SePRO Aquatic Specialist, State Extension Service, equipment manufacturer, or other experts.
- Do not connect an irrigation system (including greenhouse systems) used for pesticide application to a public water system unless the pesticide label prescribed safety devices for public water systems are in place (refer to the Chemigation Systems Connected to a Public Water Supply section of this label).
- A person knowledgeable of the chemigation system and responsible for its operation or under the supervision of the responsible person, shall shut the system down and make necessary adjustments should the need arise. The injection system should be inspected, calibrated, and maintained before application of Captain begins.

#### Chemigation Systems Connected to a Public Water Supply

- Public water system means a system for the provision to the public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.
- Chemigation systems connected to public water systems must contain a functional, reduced-pressure zone, back flow preventer (RPZ) or the functional equivalent in the water supply line upstream from the point of pesticide introduction. There shall be a complete physical break (air gap) between the flow outlet end of the fill pipe and the top or overflow rim of the reservoir tank of at least twice the inside diameter of the fill pipe.
- The pesticide injection pipeline must contain a functional, automatic, quickclosing check valve to prevent the flow of fluid back toward the injection.
- The pesticide injection pipeline must contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off

the pesticide injection pump when the water pump motor stops or in cases where there is no water pump, when the water pressure decreases to the point where pesticide distribution is adversely affected.

- Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.
- Do not apply when wind speed favors drift beyond the area intended for treatment.

### Sprinkler Chemigation Requirements

- The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
- The pesticide injection pipeline must contain a functional, automatic, quickclosing check valve to prevent the flow of fluid back toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
- The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.
- Do not apply when wind speed favors drift beyond the area intended for treatment.

## Floor (Basin), Furrow and Border Chemigation Requirements

- Systems using a gravity flow pesticide dispensing system must meter the pesticide into the water at the head of the field and downstream of a hydraulic discontinuity such as a drop structure or weir box to decrease potential for water source contamination from back flow if water flow stops.
- Systems utilizing a pressurized water and pesticide injection system must meet the following requirements:
  - The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
  - The pesticide injection pipeline must contain a functional, automatic, quickclosing check valve to prevent the flow of fluid back toward the injection pump.
  - The pesticide injection pipeline must also contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
  - The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
  - The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
  - Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

## Drip (Trickle) Chemigation Requirements

- The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water



source contamination from back flow.

- The pesticide injection pipeline must contain a functional, automatic, quickclosing check valve to prevent the flow of fluid back toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
- The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump, such as a positive displacement injection pump (e.g. diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

#### Limitations, Restrictions, and Exceptions

##### Slug Application Method for Flowing Irrigation Canals with no Functioning Potable Water Intakes

Do not use this method of application in flowing canals with functioning potable water intakes at or downstream from the application site.

For optimal control, apply Captain as soon as algae begin active growth or interfere noticeably with normal delivery of water. Heavy infestations and low flow may cause poor distribution resulting in unsatisfactory control. Under these conditions repeated applications or increasing water flow rate during application may be necessary. Apply Captain into the irrigation canal or lateral at 0.05 (6.4 fluid ounces) to 0.55 gallons (70 fluid ounces) per CFS as a slug or dump application (see above for determining CFS). Depending upon water hardness, alkalinity, velocity and algae conditions, a slug application is typically required every 5 to 30 miles. High water hardness or alkalinity levels may require the use of higher rates within the rate range above to achieve control. When velocity levels are higher (>1 foot

per second) distance between drop stations for slug applications can be increased.

Method

[Slug or dump application](#)

Timings

[As soon as algae begin active growth or interfere noticeably with normal delivery of water.](#)