Evaluation of two methods for applying dilute acetic acid for American pondweed winter bud control in the Nevada Irrigation District, California.

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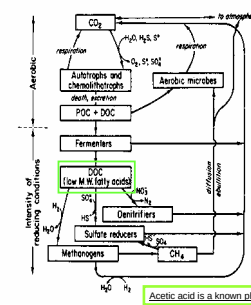
American pondweed (*Potamogeton nodosus* Poir.) is commonly found in northern California irrigation canals. The purposes of this study were to evaluate novel methods for applying dilute acetic acid to exposed sediments and to test the hypothesis that exposure of American pondweed winter buds to dilute acetic acid under field conditions would result in reduced survivorship and subsequent biomass. The treatment consisted of adding either 1703 or 3406 L of 2.3% acetic acid per 83 m^2 plot. Acetic acid was applied using either drip tape (6 plots) or soaker hoses (3 plots). Six weeks after treatment, we collected nine samples from each plot for biomass determination. American pondweed biomass was reduced (ANOVA, P < 0.001) by the acetic acid application. The reduction was observed for samples collected from the sides as well as the canal bottom when 3406 L per plot were applied. At the lower rate, there was slightly more biomass on the sides of the canal. These results confirm findings from earlier laboratory/greenhouse experiments, and suggest that application of dilute acetic acid solutions (2.3%) by drip irrigation tape may be useful in the management of American pondweed in systems that can have the water removed.

View of the test canal

Approximate location of the Nevada Irrigation District.

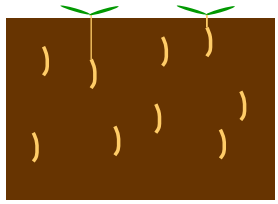
Decomposition of organic matter in sediments produces small amounts of organic acids including acetic acid.

CH_3COOH Acetic Acid

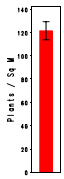


Acetic acid is a known phytotoxin.

Winter buds do not all sprout at the same time.



Treatments applied April 11-12, 2002



Nevada Irrigation District, April 2-3, 2002

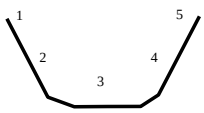
1 acre-inch (1703 liters 2.3% acetic acid) -- Drip Tape
2 acre-inches (3406 liters 2.3% acetic acid) -- Drip Tape
1 acre-inch (1703 liters 2.3% acetic acid) -- Soaker Hose

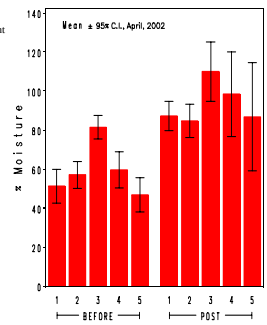
View of the soaker hose array used to apply acetic acid solutions to the plots.

Acetic acid solution was metered in two sets of drip tape. Drip tapes were placed along the canal profile to insure complete coverage.

Close-up view of solution being released from the drip tape. Two additional photos showing the complete saturation of the soil.

Canal cross section with sampling locations. Percent soil moisture increased following treatment indicating that the acetic acid solution actually penetrated to at least 12 cm deep.





Canal plot after treatment showing saturated conditions. The middle pictures illustrates the change in color observed for sprouted plants and the rightmost photo shows plants that escaped treatment due to topographic irregularities..

American pondweed in an untreated core (left) and a treated core after 11 weeks growth in an outdoor vault at Davis, California.

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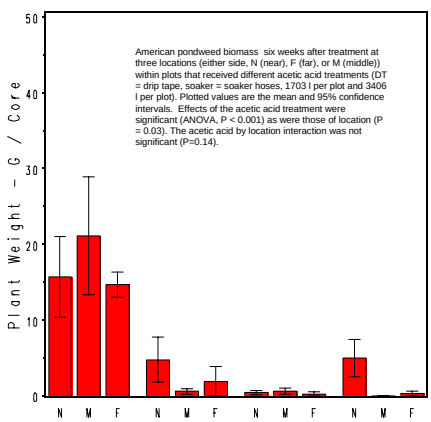
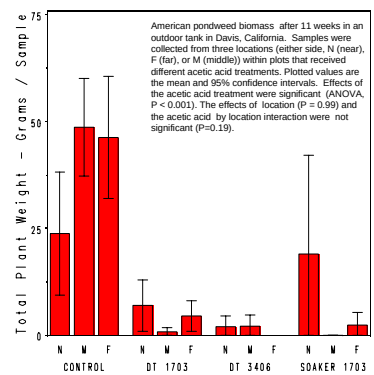
American pondweed cores in outdoor vault.



American pondweed biomass six weeks after treatment at three locations (either side, N (near), F (far), or M (middle)) within plots that received different acetic acid treatments (DT = drip tape, soaker = soaker hoses, 1703 l per plot and 3406 l per plot). Plotted values are the mean and 95% confidence intervals. Effects of the acetic acid treatment were significant (ANOVA, P < 0.001) as were those of location (P = 0.03). The acetic acid by location interaction was not significant (P=0.14).

Dilute solutions of acetic acid (2.3%) kill winter buds as effectively in field situations as in greenhouse or growth chamber tests.

Application using drip tape provides good coverage on the canal sides. This method overcomes one problem with treating canals by flooding, and it may be incorporated with plant maps to further reduce the amount applied and increase the effectiveness by treating only areas where weeds occur.



American pondweed biomass after 11 weeks in an outdoor tank in Davis, California. Samples were collected from three locations (either side, N (near), F (far), or M (middle)) within plots that received different acetic acid treatments. Plotted values are the mean and 95% confidence intervals. Effects of the acetic acid treatment were significant (ANOVA, P < 0.001). The effects of location (P = 0.99) and the acetic acid by location interaction were not significant (P=0.19).