

Post- and Pre-emergent Liverwort Control Trial

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Liverworts (*Marchantia* spp.) are non-vascular, primitive plants that form dense, matted, colonies (thalli) on the soil surface of containers in greenhouses and outdoor nursery stock. A mat of liverworts can impede water from overhead irrigations from entering the soil surface and sometimes liverworts can crowd slow growing ornamental crops. They are often a hard to manage nuisance. They spread by spores and are especially prolific in the cool, humid conditions of the central coast counties of California. This study was to test pre and post emergent applications of various conventional and biorational herbicides, and cocoa- shell mulch.

One gallon pots filled with Super Soil[®] potting mix were assembled on September 23 in the greenhouse at the UC Cooperative Extension greenhouse in Salinas, CA. Treatments included preemergent and post emergent applications of various materials (Table 1 and 2).

For pre-emergent treatments (Table 1), liverwort inoculum was prepared by blending 20 grams of liverwort thalli with 200 mls of buttermilk and 1 liter of water. All pots of pre-emergent treatments had 100 mls of this slurry added to them. They were then watered to settle the slurry and then the pre-emergent treatments were applied. In the case of the cocoa mulch treatments, the slurry was applied over the top of the mulch. The effectiveness of the treatments were determined by measuring the area of liverwort thalli that covered the pot surface 25 and 26 DAT.

For the post emergent treatments (Table 2), mature, heavily-matted, liverwort from infested propagation flats were cut into 2.5-inch diameter plugs and transplanted to 1-gallon pots on September 23 and post emergence materials were applied on October 7. In this two week period, new liverworts developed in the soil surrounding the transplanted plugs, apparently developing from gemmae that had splashed from the liverwort plug. The effectiveness of the treatments were evaluated separately on the mature plug and the young thalli by measuring the coverage of living (green) thalli 11 and 22 DAT.

The area of living (green) thalli was measured by photographing the pot surface, manipulating the color range of the image in Adobe Photoshop so that a lesion- area measurement software program (ASSESS, from the American Phytopathological Society) could be used to measure the area covered by the liverwort. All sprayed herbicides were applied at a rate of 72 gallons/acre. There were five replications of each treatment of 1-gallon pots and after the treatments were applied they were arranged in a randomized complete block design in a greenhouse bench covered with 40% shade cloth. The treated pots were misted three times per day for 2 minutes to provide a microclimate very favorable for liverwort growth.

Table 1: Pre-emergence Treatments

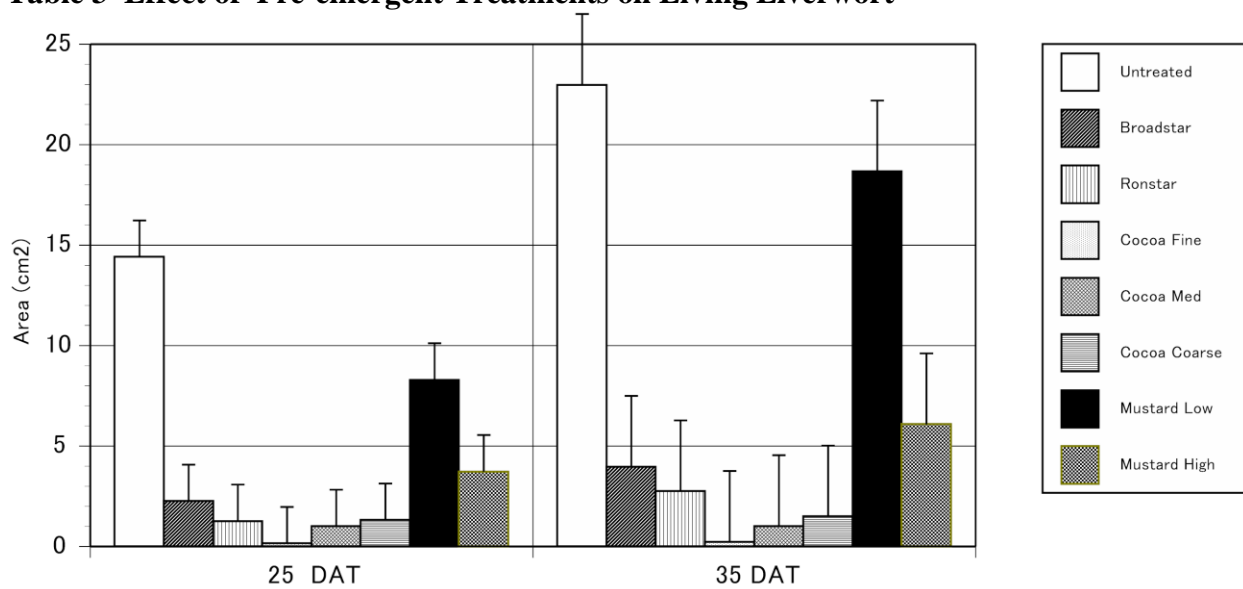
No.	Treatment	Manufacturer	A. I.	Rate	Liverwort Applied
1	Untreated			----	
2	Broadstar 0.25G	Valent Professional Products	flumioxazim	5.6 g / m ²	Before Treatment
3	Ronstar 50WSP	Bayer Environmental Science	oxadiazon	0.45 g / m ²	Before Treatment
4	Cocoa hulls – fine (2mm)	Bloomer Chocolate Company Chicago, IL		14.2 L / m ² 2 cm deep	After Treatment
5	Cocoa hulls – medium (4mm)			14.2 L / m ²	After Treatment
6	Cocoa hulls – coarse (8 mm)			14.2 L / m ²	After Treatment
7	Mustard seed meal – ground (2 mm)	MPT Mustard Products & Technologies Inc., Saskatoon, Canada		225 g / m ²	After Treatment
8	Mustard seed meal – ground (2 mm)			450 g / m ²	After Treatment

Table 2: Post-emergence Treatments

No.	Treatment	Manufacturer	Active Ing.	Rate Product / m ²	Comment
9	Untreated	----		----	
10	Mustard seed meal (2mm)	MPT Mustard Products & Technologies Inc., Saskatoon, Canada		225 g / m ²	
11	Mustard seed meal (2mm)			450 g / m ²	
12	Sporatec	Brandt Consolidated	botanical oils	1.15 ml / m ²	
13	Scythe	Gowan	pelargonic acid	4.41 ml / m ²	
14	Bryophyter	2% v/v	botanical oils	1.47 ml / m ²	
15	Shark 2EC	1.0 oz/A	carfentrazone	0.0075 ml / m ²	+ 0.25% Nonionic Surfactant
16	Weed Pharm	100% v/v	acetic acid	73.6 ml / m ²	

Cocoa mulch was the most effective in controlling liverwort germination, and there was a trend that the finer the mulch was more effective (Table 3). This was not expected because most mulches are most effective when they are coarse. Typically, coarse mulches dry out spores or seeds more effectively than finer mulches. Cocoa mulch may be working in a different way, perhaps leaching out toxic levels of a compound. Cocoa mulch is known to have very high levels of potassium and perhaps high levels of potassium are inhibitory to liverwort. Ronstar and Broadstar were moderately effective. MSM (mustard seed meal) at both rates provided uneven and a low level of control. The uneven and low control may have been result of the uneven application of either the inoculum or product. Perhaps the MSM was redistributed unevenly when the inoculum was applied overhead.

Table 3 Effect of Pre-emergent Treatments on Living Liverwort



MSM (low and high rates), Scythe, Bryophter, and Weed-Pharm completely killed all young liverworts, and the high rate of MSM completely killed all mature liverworts (Table 4 and 5). Sporatech and Shark were only moderately effective on young liverworts, and even less effective on mature liverworts.

There was no evaluation on plant tolerance in this study, so if the experimental products are used, insure that plant tolerances are first tested. For the registered products, consult the label for application information.

Table 4 Effect of Post-emergent Treatments on Living Young Liverwort

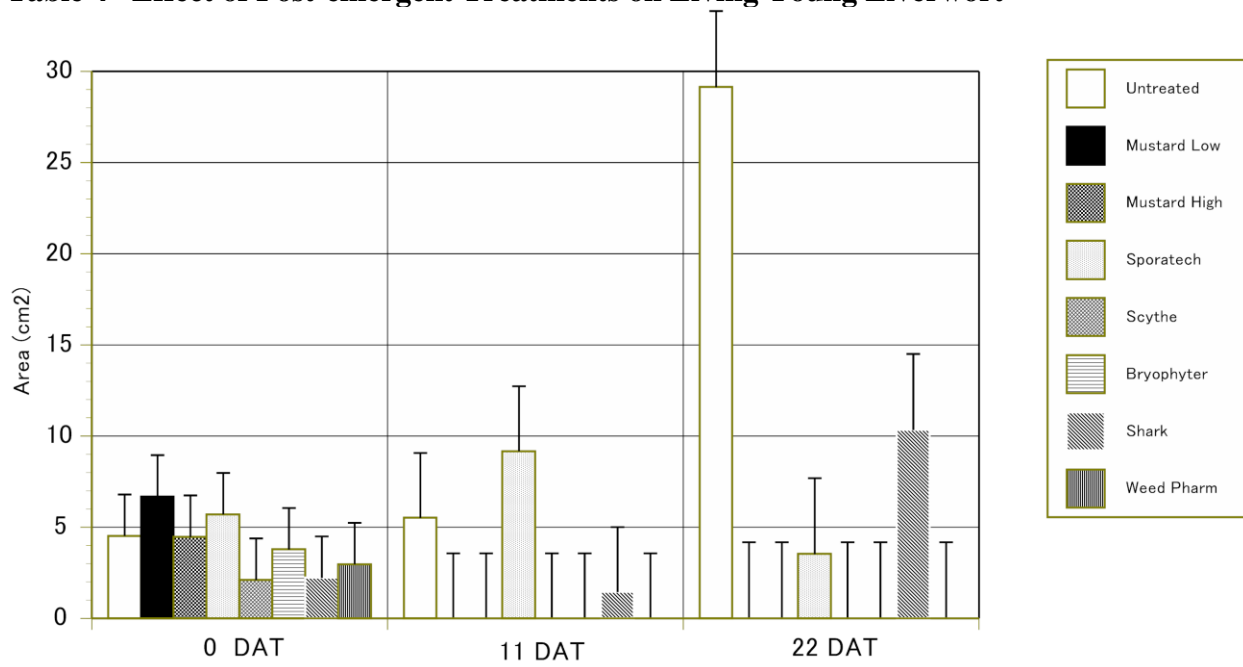


Table 5 Effect of Post-emergent Treatments on Living Mature Living Liverworts

