



## Liverwort Control in Containerized Ornamentals.

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**Index Words:** Broadstar (flumioxazin), Liverwort, *Marchantia polymorpha*, Mogeton/Gentry (quinoclamine), Preemergent Herbicides, Ronstar (oxadiazon), Showcase (isoxaben, trifluralin, oxyfluorfen).

**Nature of Work:** Liverwort (*Marchantia* spp.) can be an extremely difficult plant to control in propagation houses and containerized ornamentals. Although several herbicides claim to control liverwort, no reliable labeled herbicide exists. This, however, is about to change as Mogeton/Gentry 25WP (quinoclamine) is currently seeking registration. This product has been tested for several years, and has proven to control liverwort, but much testing is needed on performance and safety quinoclamine in hot humid conditions. To help answer some of these questions, study was designed to determine safety and liverwort efficacy of quinoclamine.

On August 10, 2006 at the Center for Applied Nursery Research, 36 pots one gallon pots of each of the following were assembled: Pawpaw (*Asimina triloba*), Oakleaf hydrangea (*Hydrangea quercifolia* 'Snowflake'), and Periwinkle (*Vinca minor*). Six, one gallon pots of each species were than placed in a 6 ft. x 6 ft. area. Before treatments were applied, 500 ml of a liverwort slurry was applied to each pot. The liverwort slurry was created by filling up a 5 gallon bucket with liverwort thallus and water. The thallus water mixture was than mixed vigorously for 5 minutes. Thallus was then removed, and the remaining water contained reproductive tissues (gammae) that easily infest containers. After applying 500 ml of the liverwort slurry, the herbicide treatment was applied, and pots were moved to assigned test area where they were arranged in a randomized complete block (RCB) design. Each treatment contained 6 replications, and each replication contained 1 subsample. The process was continued for each herbicide treatment. Except for the quinoclamine treatments, sprayable herbicides were applied with a CO<sub>2</sub> backpack sprayer calibrated to deliver 20 gallons per acre (GPA). Quinoclamine treatments were applied with a CO<sub>2</sub> backpack sprayer calibrated to deliver 100 gallons per acre (GPA). Granular herbicides were applied at the appropriate rate with a cheese shaker jar. Watering occurred on an as needed basis, and this represented approximately 1/2 to 1 inch of water per day. The treatment list was as follows:

Treatment#	Treatment	Active ingredient	Rate
1	Mogeton 26 WP	Quinoclamine	13.1 lb/A (3.4 lb ai/A)
2	Mogeton 26 WP	Quinoclamine	26.2 lb/A (6.8 lb ai/A)
3	Ronstar 2 GR	Oxadiazon	200 lb/A (4.0 lb ai/A)
4	Showcase 2.5 GR	Isoxaben, Oxyfluorfen, Trifluralin.	100 lb/A (2.5 lb ai/A)
5	Broadstar 0.25 GR	Flumioxazin	100 lb/A (0.25 lb/A)
6	Check		

% Liverwort cover and plant injury was taken at 3 and 6 weeks after treatment (WAT), and are

scheduled for ratings at 12 and 16 WAT. Plant injury was taken on a (0-100 scale) and numbers represented the following:

<b>Value</b>	<b>Plant Symptoms</b>
0	No visual injury present
10-30	Minimal injury to desirable plant. Less than 10% of the plant leaf surface area showing chlorosis and necrosis.
40-70	More noticeable plant injury or stunting. Greater than 50% of the leaf area showing symptoms of chlorosis and/or necrosis.
80-90	Plants severely injured. Most of the leaves and leaf surface showing signs of chlorosis and necrosis.
100	Plant appears dead. No signs of regrowth.

**Results and Discussion:**

No treatments caused significant injury to periwinkle, hydrangea, or pawpaw during the course of the experiment (Tables 1-3). Although not significant, injury to hydrangeas did exceed 20 percent with both Mogeton treatments at 3 WAT (Table 1). At 3 WAT, there was no significant difference in % liverwort cover. At 6 WAT, liverwort % cover was significantly less with the 2 Mogeton treatments, Broadstar, and Ronstar treatments. At 12 WAT, all treatments were significant better than the untreated control (UTC), and the higher rate of Mogeton was providing the significantly best control of liverwort.

**Significance to Industry:**

Results of this study have shown that Mogeton and other registered herbicide can provide control of liverwort in containerized ornamentals. More research needs to be performed in order to determine safety and efficacy of Mogeton in the Southeast.

**Table 1.** Injury to Pawpaw (*Asimina triloba*), Oakleaf hydrangea (*Hydrangea quercifolia* 'Snowflake'), and Periwinkle (*Vinca minor*), and % cover liverwort (*Marchantia* spp.) at 3 WAT.

Treatment#	Treatment	Rate	Periwinkle	Hydrangea	Pawpaw *	Liverwort*
			Plant injury 3 WAT			% Cover 3 WAT
1	Mogeton 26 WP	13.1 lb/A (3.4 lb ai/A)	0 a	22 a	0 a	19 a
2	Mogeton 26 WP	26.2 lb/A (6.8 lb ai/A)	0 a	23 a	2 a	18 a
3	Ronstar 2 GR	200 lb/A (4.0 lb ai/A)	0 a	12 a	3 a	8 a
4	Showcase 2.5 GR	100 lb/A (2.5 lb ai/A)	0 a	8 a	0 a	7 a
6	Broadstar 0.25 GR	100 lb/A (0.25 lb/A)	0 a	14 a	2 a	4 a
7	Check		0 a	15 a	0 a	8 a
LSD			0.0	21.4	5.0	24.9

\*Means followed by same letter do not significantly differ (P=0.05, LSD)

**Table 2.** Injury to Pawpaw (*Asimina triloba*), Oakleaf hydrangea (*Hydrangea quercifolia* 'Snowflake'), and Periwinkle (*Vinca minor*), and % cover liverwort (*Marchantia* spp.) at 6 WAT.

Treatment#	Treatment	Rate	Periwinkle	Hydrangea	Pawpaw *	Liverwort*
			Plant injury 6 WAT			% Cover 6 WAT
1	Mogeton 26 WP	13.1 lb/A (3.4 lb ai/A)	0.0 a	13.3 a	0.0 a	2.5 c
2	Mogeton 26 WP	26.2 lb/A (6.8 lb ai/A)	0.0 a	16.7 a	0.8 a	0.0 c
3	Ronstar 2 GR	200 lb/A (4.0 lb ai/A)	0.0 a	13.3 a	0.0 a	7.5 bc
4	Showcase 2.5 GR	100 lb/A (2.5 lb ai/A)	0.0 a	6.7 a	3.3 a	12.5 ab
6	Broadstar 0.25 GR	100 lb/A (0.25 lb/A)	0.0 a	0.0 a	3.3 a	5.8 bc
7	Check		0.0 a	0.0 a	0.0 a	17.5 a
LSD			0.0	23.10	4.89	7.95

\*Means followed by same letter do not significantly differ (P=0.05, LSD)

**Table 3.** Injury to Pawpaw (*Asimina triloba*), Oakleaf hydrangea (*Hydrangea quercifolia* 'Snowflake'), and Periwinkle (*Vinca minor*), and % cover liverwort (*Marchantia* spp.) at 12 WAT.

Treatment#	Treatment	Rate	Periwinkle	Hydrangea	Pawpaw *	Liverwort*
			Plant injury 12 WAT			% Cover 12 WAT
1	Mogeton 26 WP	13.1 lb/A (3.4 lb ai/A)	0 a	2 a	0 a	5 cd
2	Mogeton 26 WP	26.2 lb/A (6.8 lb ai/A)	0 a	0 a	0 a	0 d
3	Ronstar 2 GR	200 lb/A (4.0 lb ai/A)	0 a	0 a	0 a	17 b
4	Showcase 2.5 GR	100 lb/A (2.5 lb ai/A)	0 a	0 a	0 a	15 bc
6	Broadstar 0.25 GR	100 lb/A (0.25 lb/A)	0 a	0 a	0 a	12 bc
7	Check		0 a	0 a	0 a	33 a
LSD			0	23.8	0.0	11.6

\*Means followed by same letter do not significantly differ (P=0.05, LSD)