Differential Response of Liverwort (*Marchantia polymorpha*) Tissue to POST-Applied Quinoclamine

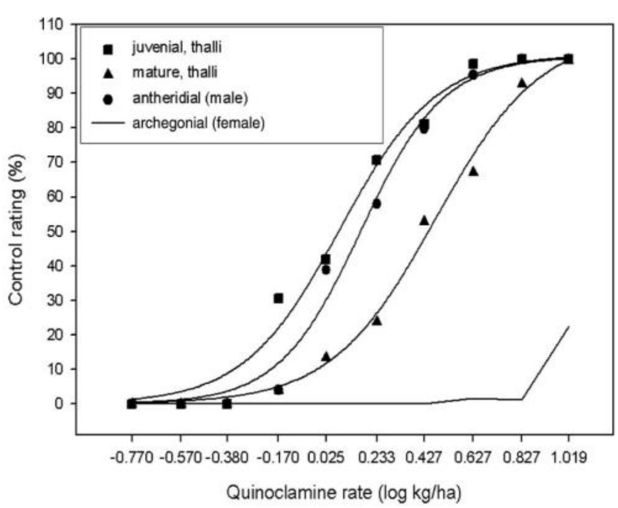
Liverwort is a nonvascular, chlorophyll-containing plant that can be problematic in greenhouse and nursery crops with reproduction by sexual and asexual means. POST-applied Quinoclamine is used to control liverwort. Liverwort structures differ in their sensitivity to Quinoclamine with female (archegonial receptacles) more tolerant of quinoclamine than either male (antheridial receptacles) or the leaf-like structures (thalli). The objective of the study was to: 1) document the degree of differential sensitivity between tissues to quinoclamine, and 2) to determine the basis of this differential sensitivity.

The dose that resulted in 50% of the population being controlled (I_{50}) of antheridial receptacles and juvenile thalli were estimated to be 1.60 and 1.27 kg·ha^{-1}, respectively. The I_{50} of archegonial receptacles could not be estimated, but exceeded 10.45 kg·ha^{-1}. Chlorophyll content varied between liverwort tissues, but the content did not correlate to quinoclamine sensitivity (Table 1 and Figure A). A single drop of ^{14}C-quinoclamine was then applied using a micro-applicator to the selected liverwort tissues to measure the potential absorption of the different tissues. Absorption was less in archegonial receptacles than in either antheridial receptacles or thalli. This differential absorption can likely be attributed to different pore characteristics (Figure B).

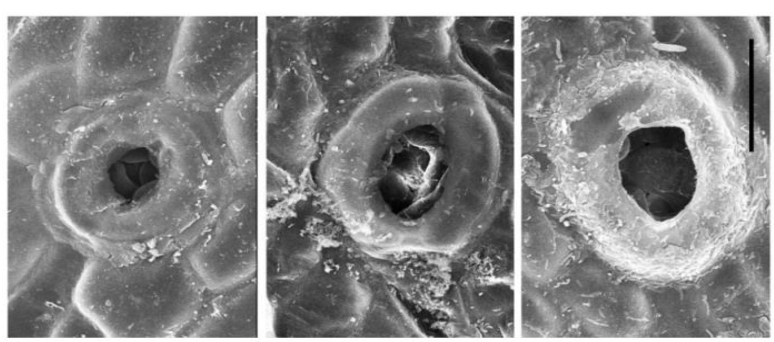
Scanning electron microscopy of the surface of the liverwort tissues revealed that archegonial receptacles had smaller pores than either antheridial receptacles or thalli. The tolerance of archegonial receptacles to quinoclamine can be partially, but not exclusively, attributed to reduced absorption. This reduced absorption may be attributed to the limited pore size and less total pore area of the archegonial receptacles. Thus we conclude that other factors beyond those that we evaluated here are likely involved and the differential absorption resulting from differential pore characteristics provided only a partial explanation for the differential quinoclamine sensitivity.

Table 1. Parameters investigated as possible explanations for the differential sensitivity between liverwort tissues to POST-applied quinoclamine. Means followed by different letters are significantly different by Fisher's Protected LSD test at the 0.05 level.

	^{14}C-Quinoclamine absorption[a]			Pore characteristics			
Liverwort tissue	Plants vertical	Plants horizontal[b]	Chlorophyll content	Pore number	Pore diameter	Area per pore	Total pore area
	% of applied		µg g^{-1} tissue	# mm^{-2}	µm	µm^2	µm^2 mm^{-2}
Archegonial receptacles (female)	29.3 b[c]	22.2 b	0.72b	140 a	16 b	203 b	28,420
Antheridial receptacles (male)	48.0 a	55.3 a	0.29c	86 ab	33 b	852 b	73,272
Thalli, juvenile	48.2 a	—	1.09a	60 b	37 a	1,076 a	64,560



Figures A and B. A (left) shows regression analysis of quinoclamine sensitivity by selected liverwort tissues. B (below) shows relative pore size of representative archegonial (left), antheridial (middle), and thallus (right) tissues. All photos are at X1,500 magnification. The solid black



Altland, J.E., Wehtje, G., Sibley, J., Miller, M., Gilliam, C., Krause, C.R. 2011. Differential response of liverwort (Marchantia polymorpha) tissue to POST-applied quinoclamine. Weed Technology 25:580-585.

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