Evaluating ornamentals for root infection and spore production

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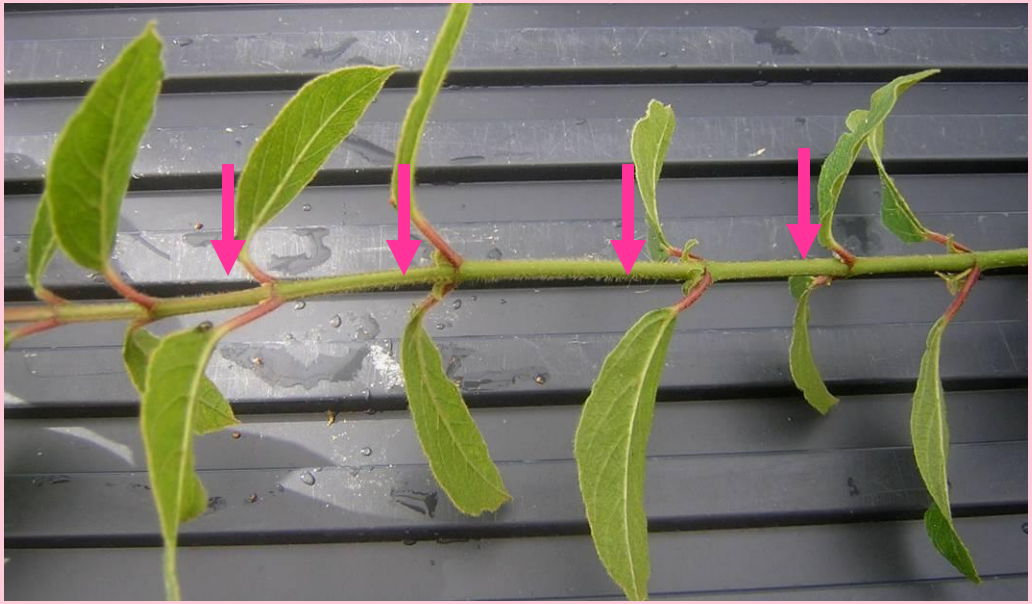
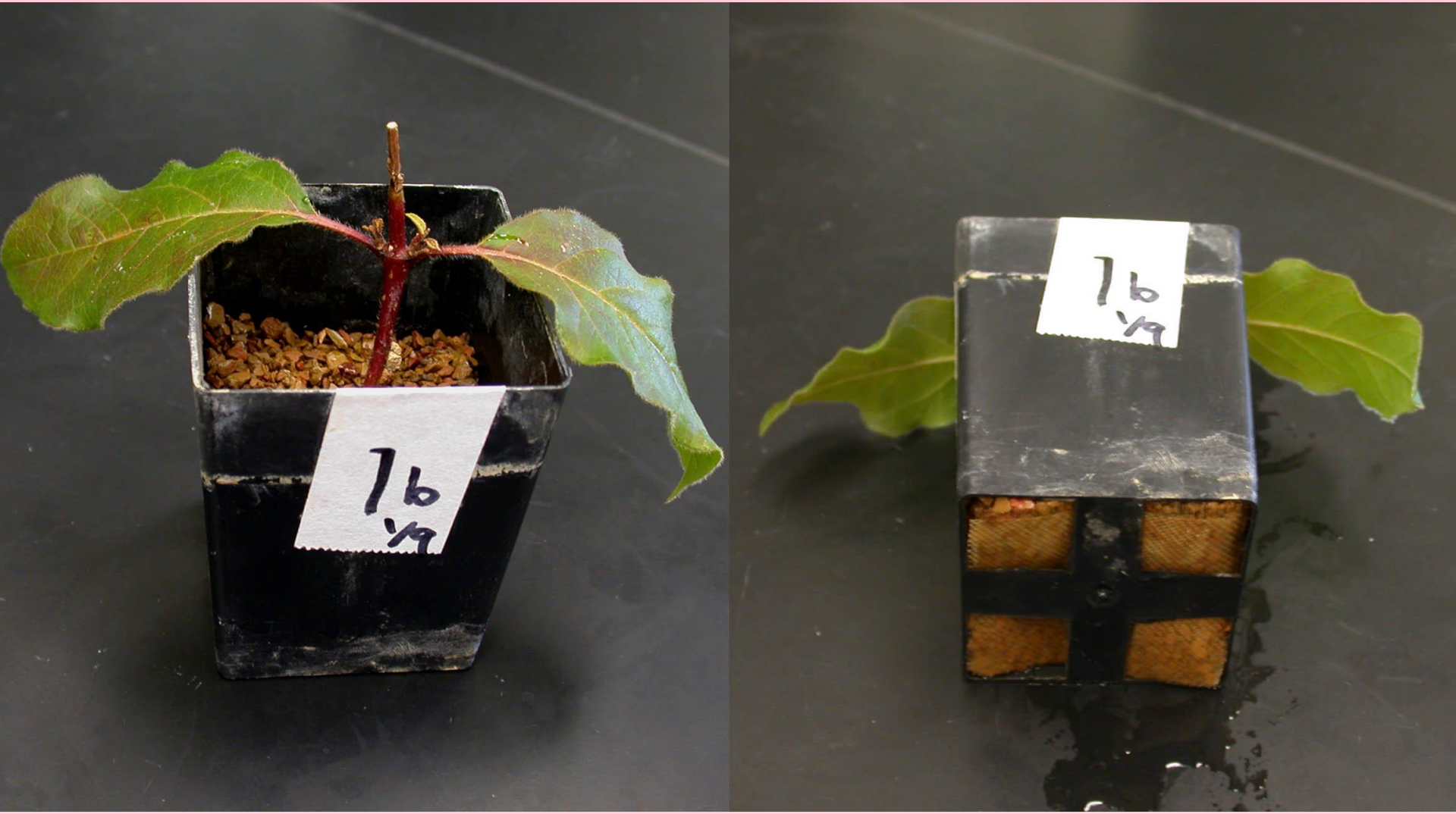
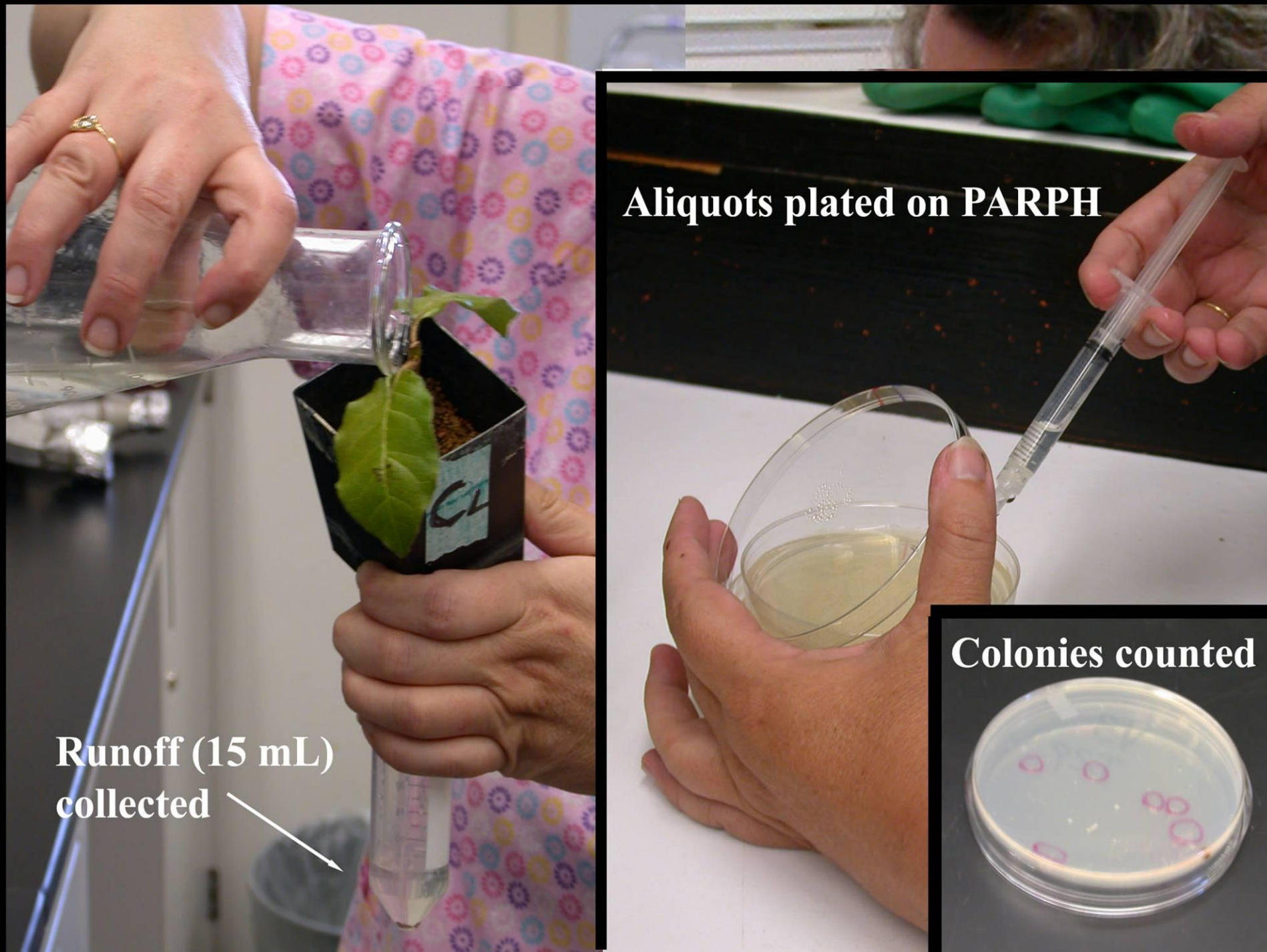
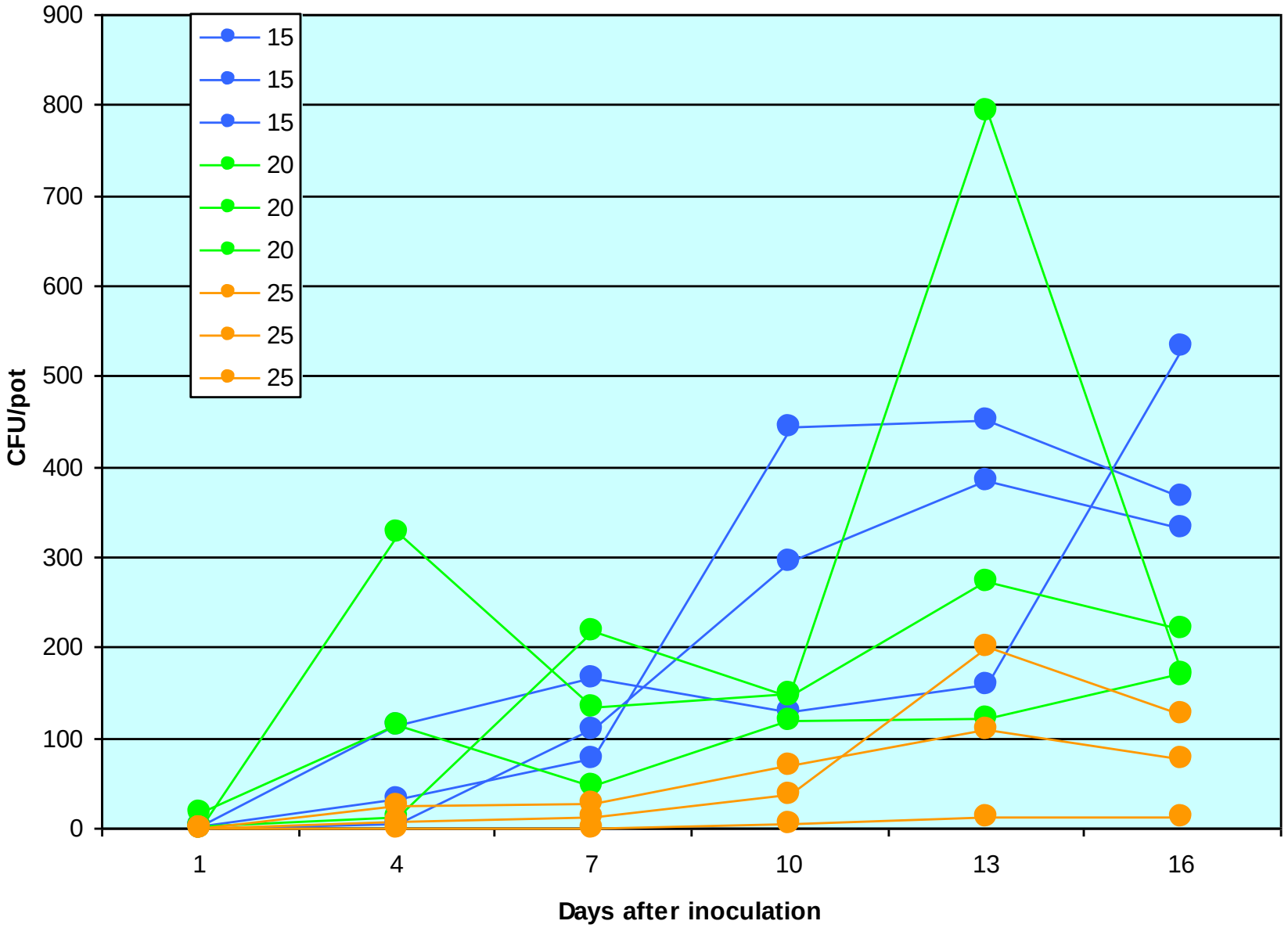



1b
1b


Runoff (15 mL)
collected
Aliquots plated on PARPH
Colonies counted


Inoculum in runoff from plants incubated at different temperatures
CFU/pot
900
800
700
600
500
400
300
200
100
0
1
4
7
10
13
16
Days after inoculation
15
15
15
20
20
20
25
25
25

Use of the runoff assay for screening potential hosts

- Test all plants against positive control *Viburnum tinus*
- Take runoff samples at 1,4,7,(10), 13, 16 days
- At experiment end, plate root segments to determine % infection
- Dry total root system and take weight.

Acer rubra	12 plants
Alnus incana	12 plants
Arctostaphylos uva-ursi	9 plants
Baccharis halimifolia	12 plants
Betula occidentalis	8 plants
Celtis occidentalis	7 plants
Cephalanthus occidentalis	12 plants
Clethra alnifolia	8 plants
Cornus florida	11 plants
Cornus sericea	11 plants
Pseudotsuga menziesii	14 plants
Epilobium ciliatum	12 plants
Euonymus alata	8 plants
Fraxinus americana	8 plants
Fraxinus profunda	12 plants
Ilex glabra	12 plants
Itea virginica	12 plants
Kalmia latifolia	12 plants
Larix laricina	8 plants
Ligustrum vulgare	12 plants
Lindera benzoin	15 plants
Liquidambar styraciflua	12 plants
Liriodendron tulipifera	8 plants
Lonicera dioica	12 plants
Maclura pomifera	4 plants
Magnolia stellata	12 plants
Nyssa sylvatica	12 plants
Parthenocissus quinquefolia	12 plants
Persea borbonia	16 plants
Hydrangea quercifolia	10 plants
Pieris	8 plants
Pteris, sp.	12 plants
Quercus prinus	20 plants
Quercus palustris	12 plants
Quercus alba	12 plants
Quercus rubra	12 plants
Rhododendron 'Cunningham's White'	16 plants
Rosa palustris	12 plants
Salix caprea	16 plants
Salix eriocephala	7 plants
Salix lucida	12 plants
Sassafras officinale	7 plants
Smilacina racemosa	8 plants
Spirea douglasii	12 plants
Vitis vulpina	12 plants

Is it a foliar host?
Is it a riparian species?
Is it ecologically/economically important?

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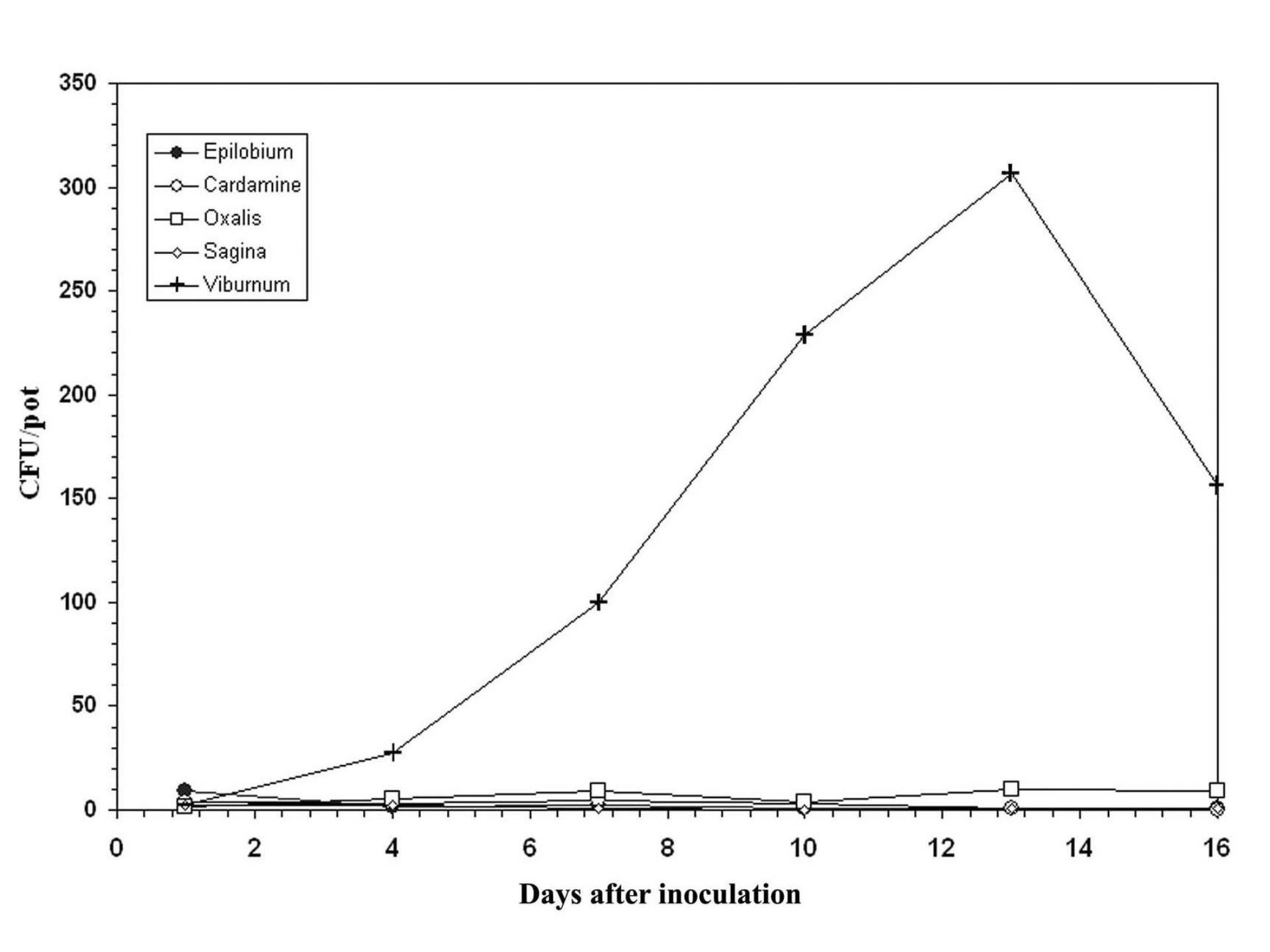
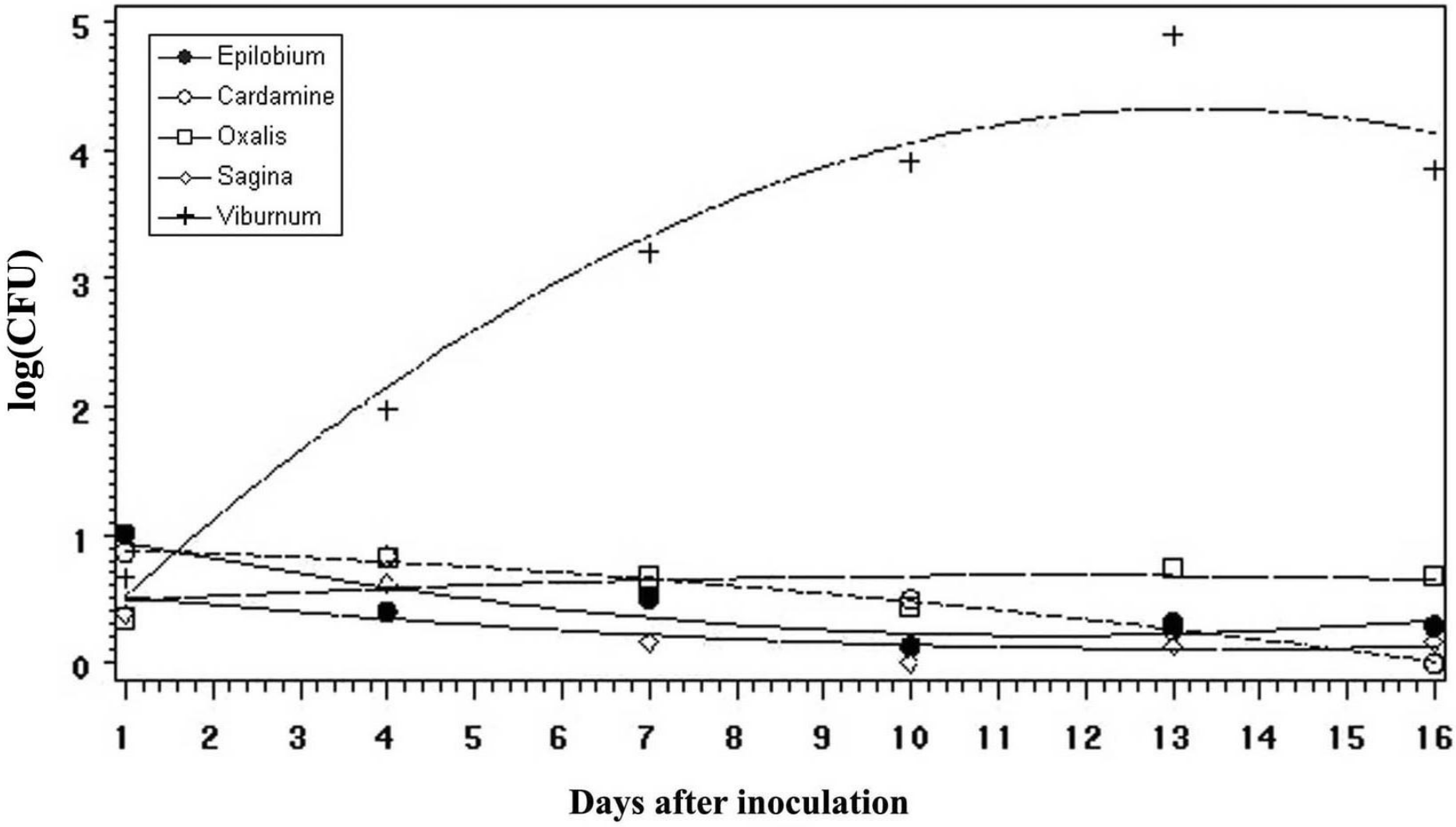
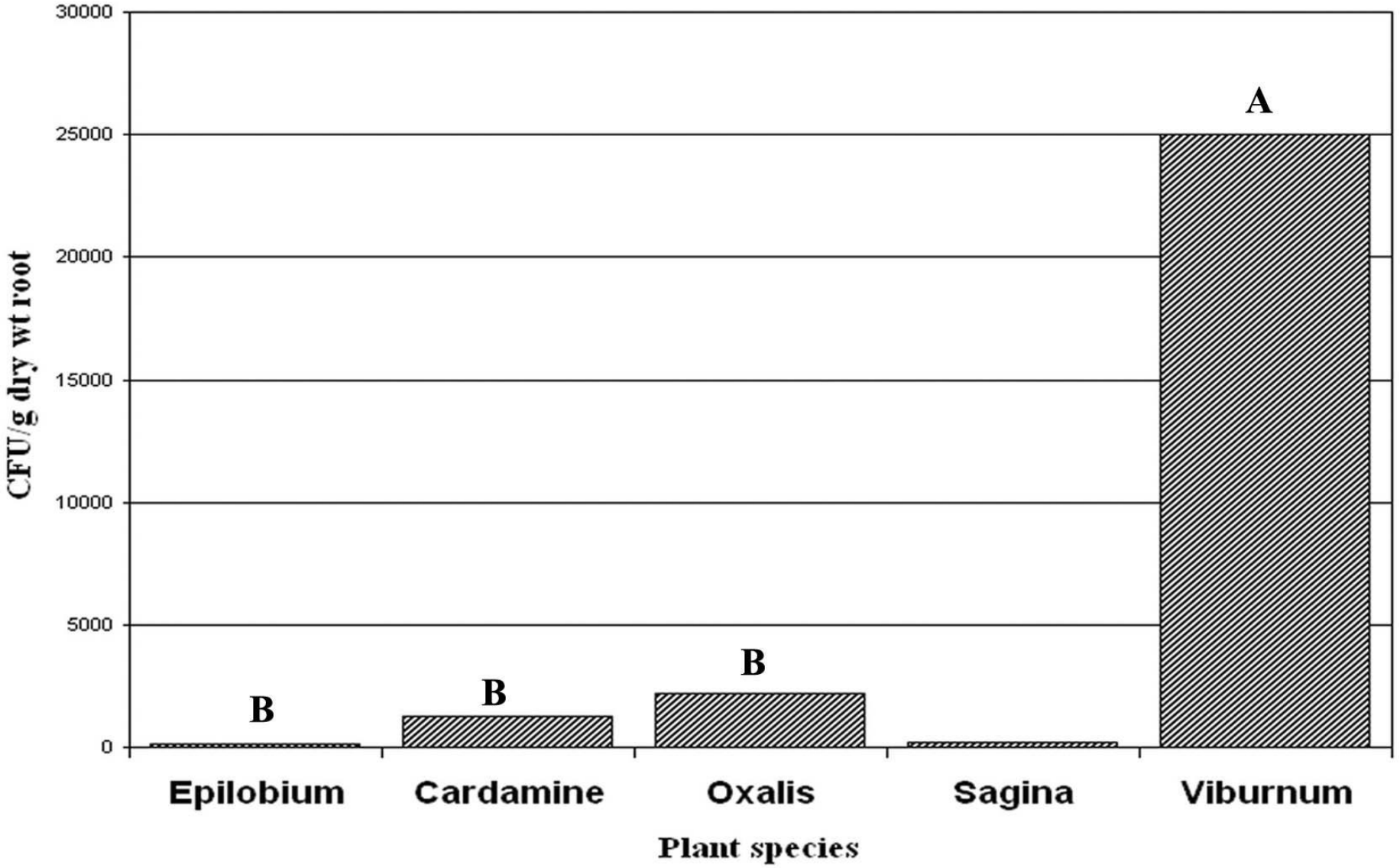
Comparison of various nursery plants to *V. tinus*

	Trials	Colonies/pot	weight (1)	Col/g dry rt	weight (2)	% root colonized (washed)	% root colonized (ster.)
Arctostaphylos uva-ursi	**3**	223	0.17	12068	0.23	18.6	7.7
Viburnum tinus		1276	1.00	53533	1.00	22.6	13.9
Cornus Florida	**3**	35	0.04	262	0.01	4.8	0.7
Viburnum tinus		885	1.00	22932	1.00	68.5	43.5
Cornus sericea	**5**	49	0.14	215	0.02	7.4	1.2
Viburnum tinus		341	1.00	9265	1.00	51.7	41.3
Hydrangea quercifolia	**3**	16	0.01	187	0.01	1.7	0.0
Viburnum tinus		1528	1.00	27611	1.00	33.6	22.5
Ilex glabra	**3**	41	0.09	1182	0.16	3.3	0.2
Viburnum tinus		486	1.00	7335	1.00	30.6	27.1
Kalmia 'Olympic Wedding'	**3**	140	0.19	404	0.02	7.4	8.0
Viburnum tinus		719	1.00	18387	1.00	24.9	23.9
Ligustrum vulgare	**5**	11	0.04	24	0.02	10.2	1.3
Viburnum tinus		267	1.00	1316	1.00	72.2	43.0

	Trials	Colonies/pot	weight (1)	Col/g dry root	weight (2)	% root colonized (washed)	% root colonized (ster.)
Lonicera dioica	4	30	0.10	298	0.27	30.4	0.6
Viburnum tinus		309	1.00	1104	1.00	41.2	20.2
Magnolia stellata	3	12	0.01	385	0.01	5.8	1.7
Viburnum tinus		939	1.00	26457	1.00	38.3	28.7
Rhododendron 'Cunninigham's White'		56	0.25	1104	0.46	34.1	26.8
Viburnum tinus		227	1.00	2401	1.00	36.4	32.7
Rosa palustris	3	26	0.04	615	0.03	11.3	1.1
Viburnum tinus		677	1.00	17887	1.00	65.4	41.2
Salix caprea	3	29	0.06	455	0.04	0.3	0.0
Viburnum tinus		468	1.00	10825	1.00	0.7	0.4
Spirea douglasii	4	34	0.03	831	0.02	19.0	2.7
Viburnum tinus		1198	1.00	34592	1.00	41.7	33.4

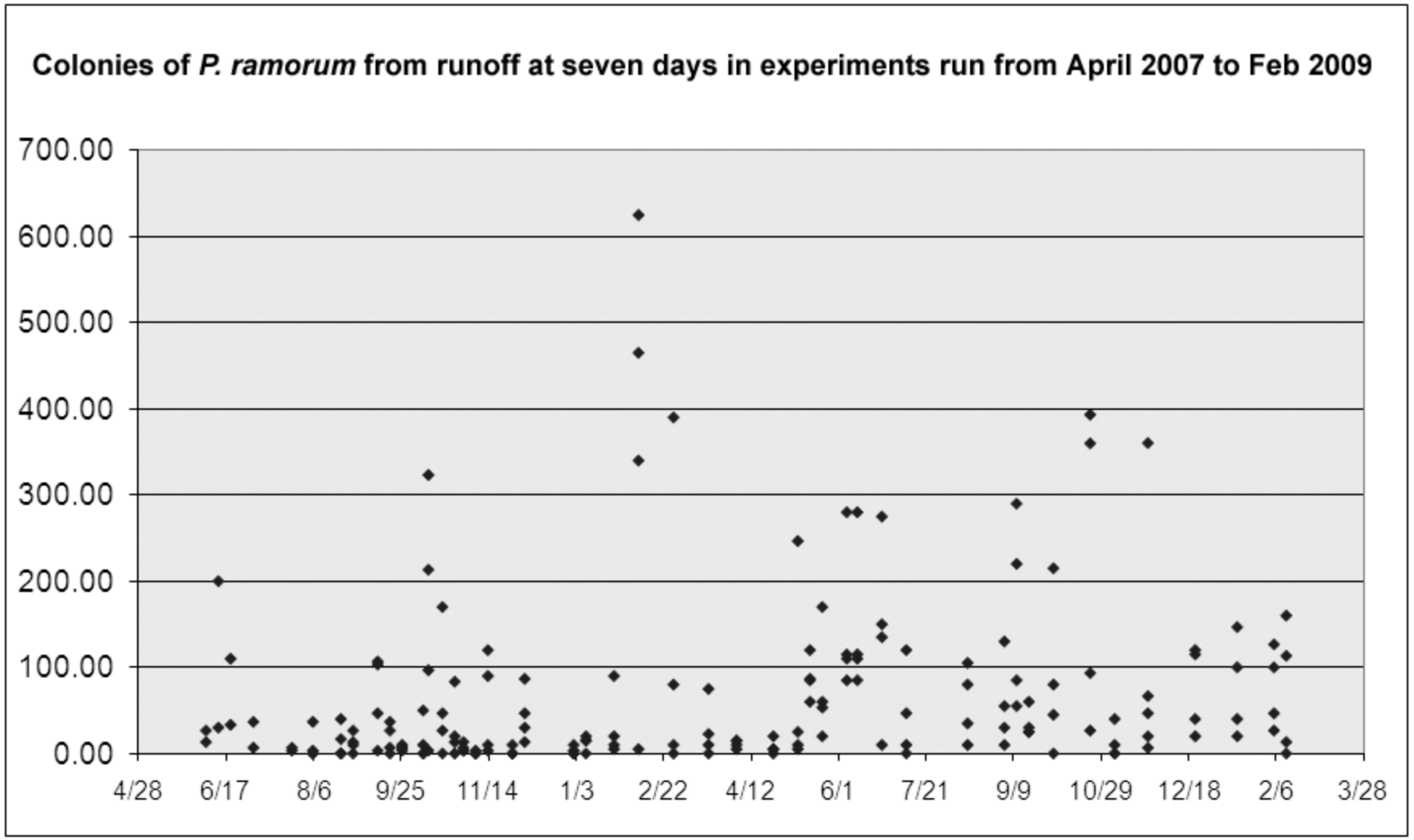

Epilobium
Cardamine
Oxalis
Sagina
Viburnum
CFU/pot
Days after inoculation
0
50
100
150
200
250
300
350
0
2
4
6
8
10
12
14
16


Epilobium
Cardamine
Oxalis
Sagina
Viburnum
log(CFU)
0
1
2
3
4
5
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Days after inoculation


30000
25000
20000
15000
10000
5000
0
CFU/g dry wt root
A
B
B
B
Epilobium
Cardamine
Oxalis
Sagina
Viburnum
Plant species

Significance to nurseries

Plant-to-plant spread?



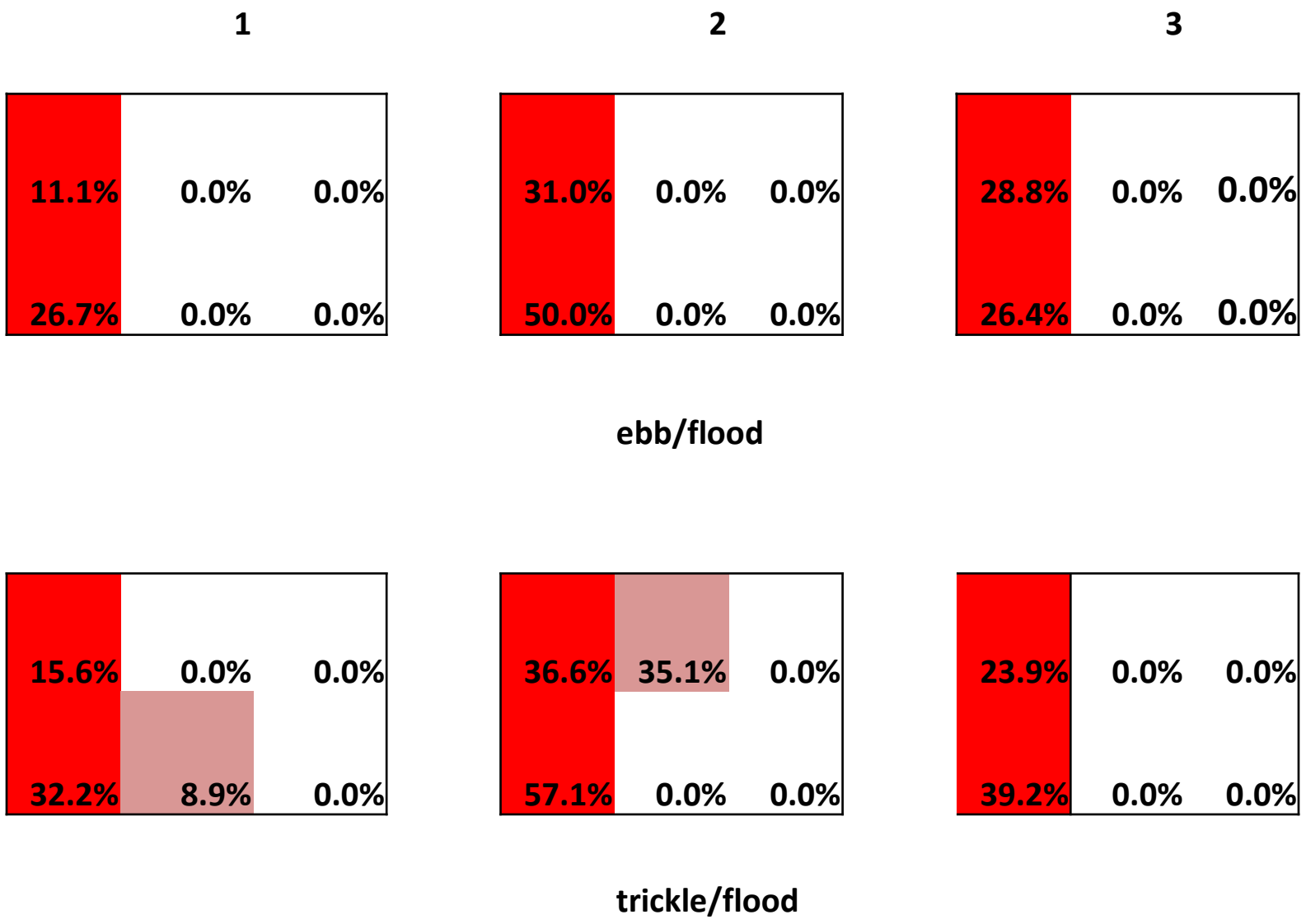
Average = 66 CFU/pot = 3.3 CFU/mL

Concentration of sporangia (spores/ml) required to infect cuttings of *Viburnum tinus*

	% root infection	
	expt1	expt2
500	32.0%(4)	43.7%(4)
50	34.9%(4)	39.6%(4)
5	23.0%(4)	15.3%(2)
0	0.0%(0)	0.0%(0)


Trickle/Flood


Ebb/Flood


1
2
3
11.1%
0.0%
0.0%
26.7%
0.0%
0.0%
31.0%
0.0%
0.0%
50.0%
0.0%
0.0%
28.8%
0.0%
0.0%
26.4%
0.0%
0.0%
ebb/flood
15.6%
0.0%
0.0%
32.2%
8.9%
0.0%
36.6%
35.1%
0.0%
57.1%
0.0%
0.0%
23.9%
0.0%
0.0%
39.2%
0.0%
0.0%
trickle/flood

Conclusions

- **Some nursery species get root infections, and those roots produce inoculum**
- ***Viburnum* roots can get infected at an inoculum concentration of 5 sporangia/mL**
- **Root-to-root spread can be observed in *Viburnum* under flooded conditions.**