

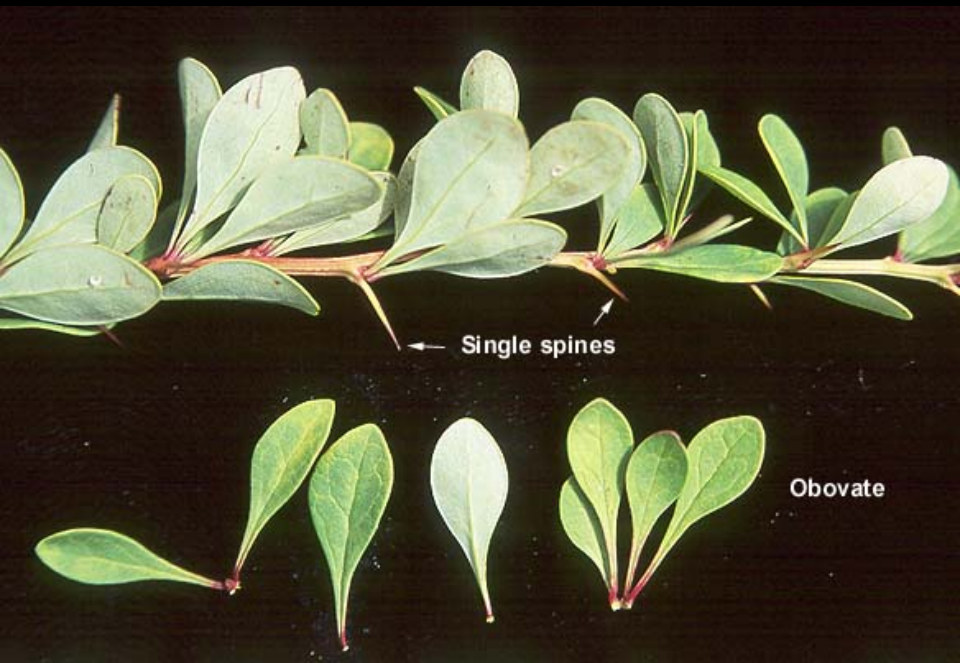
Berberis thunbergii Japanese barberry

Introduced 1875



Naturalized by the early 1900s





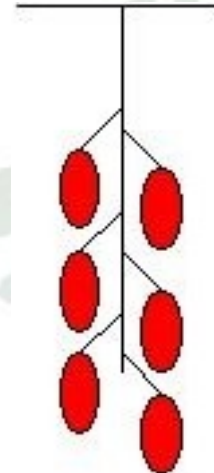
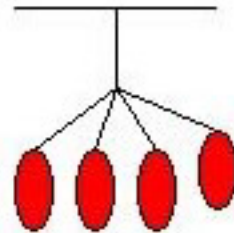
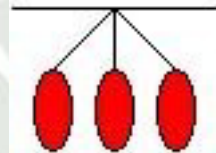
Berberis thunbergii

Berberis vulgaris



Berberis x ottawensis

| Character | <i>Berberis thunbergii</i> | <i>Berberis xottawensis</i> | <i>Berberis vulgaris</i> |
|-------------------|----------------------------|-----------------------------|--------------------------|
| Branch Spines | 1 | varies | 3 |
| Inflorescence | Sessile umbel | Subumbellate -raceme | Raceme |
| Leaf margin | Entire | Entire | Serrate |
| Berry consistency | Dry | Dry | Juicy |



Barberry Market Breakdown



75% of sales
'Crimson Pygmy'



25% of sales
'Rose Glow',
yellow/purple
dwarf cultivars





'Golden Devine'



'Helmond Pillar'



'Kobold'



'Bagatelle'



'Rose Glow'



'Tara' Emerald Carousel



'Monry' Sunsation



'Pow Wow'



'Aurea'



'Bailone' Ruby Carousel



'Sparkle'



'Royal Cloak'



Berberis thunbergii cultivars – Fruit per plant

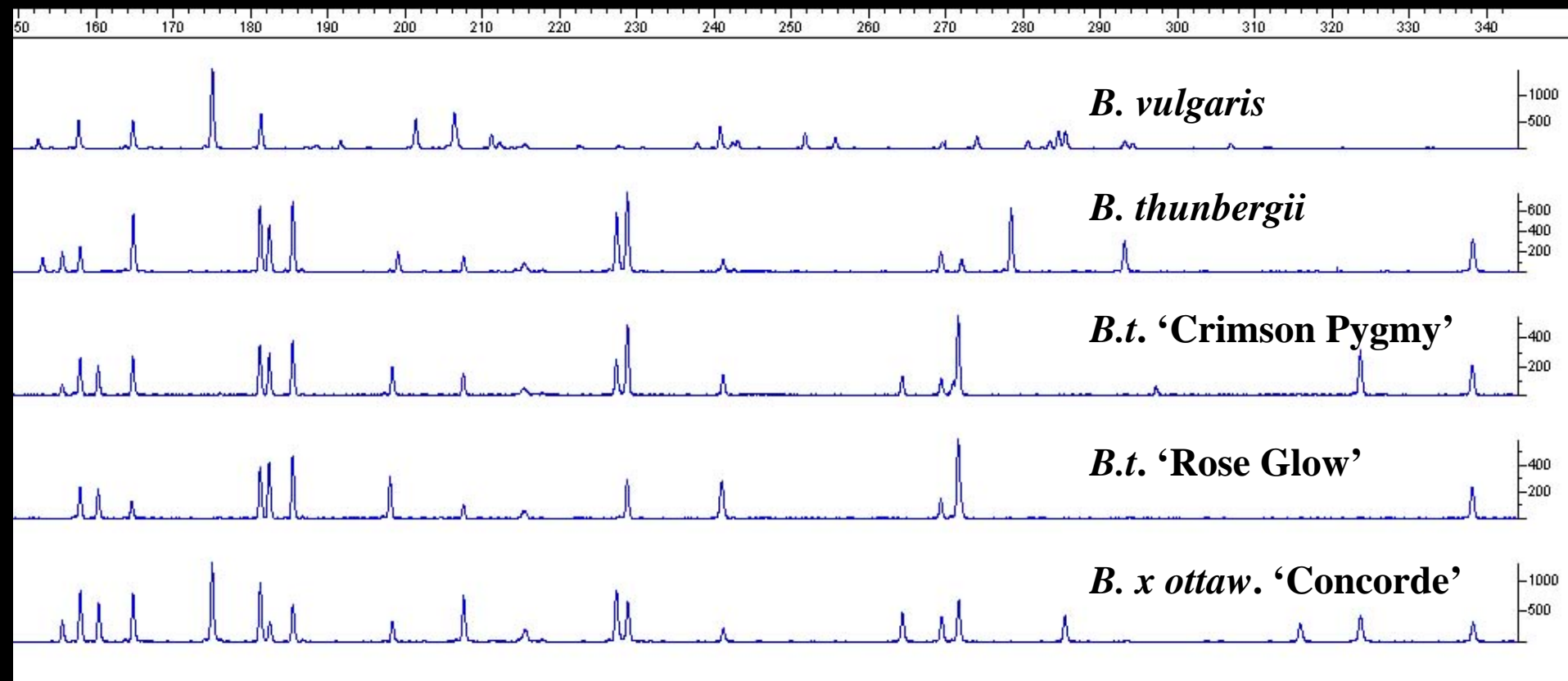
| Cultivar | 2005 | 2006 | 2007 |
|-----------------|-------------|-------------|-------------|
| Crimson Pygmy | 429 | 2759 | n/c |
| Crimson Velvet | 77 | 6675 | n/c |
| Erecta | 5 | 106 | 536 |
| Golden Carousel | 165 | 681 | n/c |
| Golden Devine | 0 | 0 | 0.33 |
| Gold Nugget | 22 | 104 | 256 |
| Gold Ring | 67 | 271 | 954 |
| Green Pygmy | 556 | 445 | n/c |
| Helmond Pillar | 37 | 209 | 153 |
| Inermis | 32 | 354 | 1152 |
| Jade Carousel | 517 | 2267 | n/c |
| JN Redleaf | 9 | 14 | 448 |

Berberis thunbergii cultivars – Fruit per plant

| Cultivar | 2005 | 2006 | 2007 |
|-------------------------|-------------|-------------|-------------|
| JN Variegated | 3 | 34 | 768 |
| Kelleris | 5 | 425 | n/c |
| Kobold | 842 | 1397 | n/c |
| Lime Glow | 27 | 333 | 254 |
| Lustre Green | 611 | 4257 | n/c |
| Marshall Upright | 232 | 3249 | n/c |
| <i>B. x mentorensis</i> | 0 | 1 | 0 |
| Painter's Palette | 16 | 319 | 1177 |
| Pow Wow | 61 | 430 | n/c |
| Red Bird | 0 | 1 | 0 |
| Red Chief | 0 | 0 | 0 |
| Red Rocket | 167 | 237 | 1332 |

AFLP

Amplified Fragment Length Polymorphism





Dichotomous identification key for 43 cultivars using 23 AFLP markers

| | | | |
|------------------------------------|---|---------------------------------------|---|
| A. Primer 4 at 113bp..... | Go to B. | V. Primer 4 at 174bp..... | Go to W. |
| A. Primer 4 absent at 113bp..... | Go to S. | V. Primer 4 absent at 174bp..... | Go to Z. |
| B. Primer 5 at 235bp..... | Go to C. | W. Primer 6 at 157bp..... | 'Crimson Velvet' |
| B. Primer 5 absent at 235bp..... | Go to D. | W. Primer 6 absent at 157bp..... | 'Silver Mile' |
| C. Primer 3 at 90bp..... | 'Kelleris' (confirmation Primer 1 at 101bp, 193bp). | X. Primer 1 at 105bp..... | Go to Y. |
| C. Primer 3 absent at 90bp..... | Go to G. | X. Primer 1 absent at 105bp..... | Go to AA. |
| D. Primer 1 at 233bp..... | Go to E. | Y. Primer 3 at 90bp..... | 'Tara' Emerald Carousel® (confirmation Primer 2 at 239bp, Primer 5 at 164bp) |
| D. Primer 1 absent at 233bp..... | Go to H. | Y. Primer 3 absent at 90bp..... | 'Baisel' Golden Carousel® (confirmation Primer 2 at 187bp, Primer 6 at 136bp) |
| E. Primer 3 at 77/78bp..... | Go to F. | Z. Primer 3 at 193bp..... | 'Royal Cloak' (confirmation Primer 1 at 81bp) |
| E. Primer 3 absent at 77/78bp..... | 'Bogozam' Bonanza Gold™ | Z. Primer 3 absent at 193bp..... | 'Berberis vulgaris' 'Atropurpurea' |
| F. Primer 3 at 90bp..... | 'Angel Wings'™ (confirmation Primer 3 at 79bp, Primer 4 at 174bp) | AA. Primer 3 at 205/206bp..... | 'Antares' |
| F. Primer 3 absent at 90bp..... | 'Bailgreen' Jade Carousel® (confirmation Primer 4 at 210bp) | AA. Primer 3 absent at 205/206bp..... | Go to BB. |
| G. Primer 1 at 141bp..... | 'Golden Ring' (confirmation Primer 1 at 102bp, Primer 4 at 210bp) | BB. Primer 3 for 90bp..... | 'Minor' (confirmation Primer 3 at 193bp) |
| G. Primer 1 absent at 141bp..... | 'Monry' Sunstation™ | BB. Primer 3 absent for 90bp..... | Go to CC. |
| H. Primer 3 at 90bp..... | Go to I. | CC. Primer 5 at 77bp..... | Go to DD. |
| H. Primer 3 absent at 90bp..... | Go to J. | CC. Primer 5 absent at 77bp..... | 'Helmond Pillar'. |
| I. Primer 3 at 193bp..... | 'JN Variegated' Stardust™ | DD. Primer 1 at 102bp..... | Go to EE. |
| I. Primer 3 absent at 193bp..... | 'Painter's Palette' | DD. Primer 1 absent at 102bp..... | Go to FF. |
| J. Primer 3 at 79bp..... | Go to K. | EE. Primer 1 at 141bp..... | 'Bailtwo' Burgandy Carousel® (confirmation Primer 3 at 77/78bp) |
| J. Primer 3 absent at 79bp..... | Go to M. | EE. Primer 1 absent at 141bp..... | 'Rose Glow' (confirmation Primer 1 absent at 76bp) |
| K. Primer 3 at 210bp..... | Go to L. | FF. Primer 3 at 77/78bp..... | 'Red Chief' |
| K. Primer 3 absent at 210bp..... | Go to O. | FF. Primer 3 absent at 77/78bp..... | Go to GG. |
| L. Primer 1 at 102bp..... | 'Sparkle' (confirmation Primer 5 at 130bp, Primer 6 at 88bp) | GG. Primer 3 at 202bp..... | Go to HH. |
| L. Primer 1 absent at 102bp..... | 'Green Pygmy'. | GG. Primer 3 absent at 202bp..... | Go to II. |
| M. Primer 4 at 174bp..... | Go to N. | HH. Primer 3 at 210bp..... | 'Monlers' Gold Nugget™ |
| M. Primer 4 absent at 174bp..... | Go to P. | HH. Primer 3 absent at 210bp..... | Go to KK. |
| N. Primer 4 at 258bp..... | 'Golden Devine' | II. Primer 1 at 141bp..... | Go to JJ. |
| N. Primer 4 absent at 258bp..... | 'Stan's Variegated' | II. Primer 1 absent at 141bp..... | Go to LL. |
| O. Primer 1 at 102bp..... | 'Anderson' Lustre Green™ | JJ. Primer 4 at 69bp..... | 'Red Rocket' (confirmation Primer 3 at 224bp) |
| O. Primer 1 absent at 102bp..... | 'Bailone' Ruby Carousel® | JJ. Primer 4 absent at 69bp..... | 'Marshall Upright' |
| P. Primer 4 at 219bp..... | Go to Q. | KK. Primer 4 at 174bp..... | 'Bagatelle' |
| P. Primer 4 absent at 219bp..... | Go to R. | KK. Primer 4 absent at 174bp..... | 'Kobold' |
| Q. Primer 1 at 101bp..... | 'Erecta' | LL. Primer 3 at 79bp..... | Go to MM. |
| Q. Primer 1 absent at 101bp..... | 'Pow Wow' | LL. Primer 3 absent at 79bp..... | 'JN Redleaf' Ruby Jewel™ |
| R. Primer 4 at 258bp..... | 'Aurea' | MM. Primer 4 at 138bp..... | 'Gentry Cultivar' Royal Burgandy™ |
| R. Primer 4 absent at 258bp..... | 'Lime Glow' | MM. Primer 4 absent at 138bp..... | Go to NN. |
| S. Primer 3 at 100bp..... | Go to T. | NN. Primer 4 at 158bp..... | 'Redbird' |
| S. Primer 3 absent at 100bp..... | Go to X. | NN. Primer 4 absent at 158bp..... | 'Crimson Dwarf', 'Crimson Pygmy' or 'Monomb' Cherry Bomb™ |
| T. Primer 5 at 202bp..... | Go to U. | | |
| T. Primer 5 absent at 202bp..... | 'Criruzam' Crimson Ruby™ (confirmation Primer 3 at 202bp) | | |
| U. Primer 3 at 77/78bp..... | Go to V. | | |
| U. Primer 3 absent at 77/78bp..... | 'Concorde' (confirmation Primer 4 at 228bp) | | |

FIG. 2

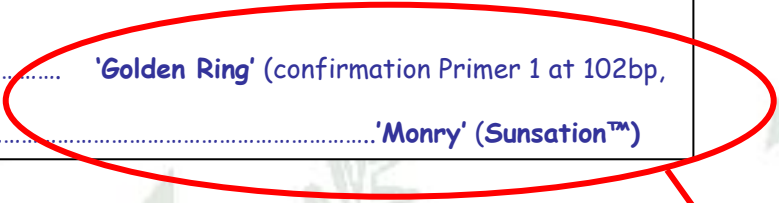
•Could not distinguish Crimson Dwarf, Crimson Pygmy and 'Monomb' Cherry Bomb™

Excerpt from key

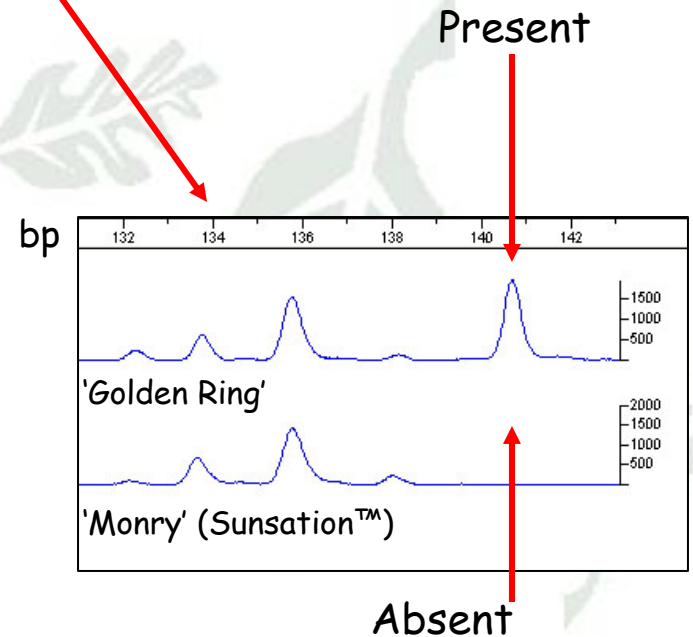
| | |
|----------------------------------|---|
| B. Primer 5 at 235bp..... | Go to C. |
| B. Primer 5 absent at 235bp..... | Go to D. |
| C. Primer 3 at 90bp..... | 'Kelleris' (confirmation Primer 1 at 101bp). |
| C. Primer 3 absent at 90 bp..... | Go to G. |
| D. Primer 1 at 233bp..... | Go to E. |
| D. Primer 1 absent at 233bp..... | Go to H. |
| E. Primer 3 at 78bp..... | Go to F. |
| E. Primer 3 absent at 78bp..... | 'Bogozam' (Bonanza Gold™) |
| F. Primer 3 at 90bp..... | 'Angel Wings'™ (confirmation Primer 3 at 79bp, Primer 4 at 174bp) |
| F. Primer 3 absent at 90bp..... | 'Bailgreen' (Jade Carousel®) (confirmation Primer 4 at 210bp) |
| G. Primer 1 at 141bp..... | 'Golden Ring' (confirmation Primer 1 at 102bp, Primer 4 at 210bp) |
| G. Primer 1 absent at 141bp..... | 'Monry' (Sunsation™) |



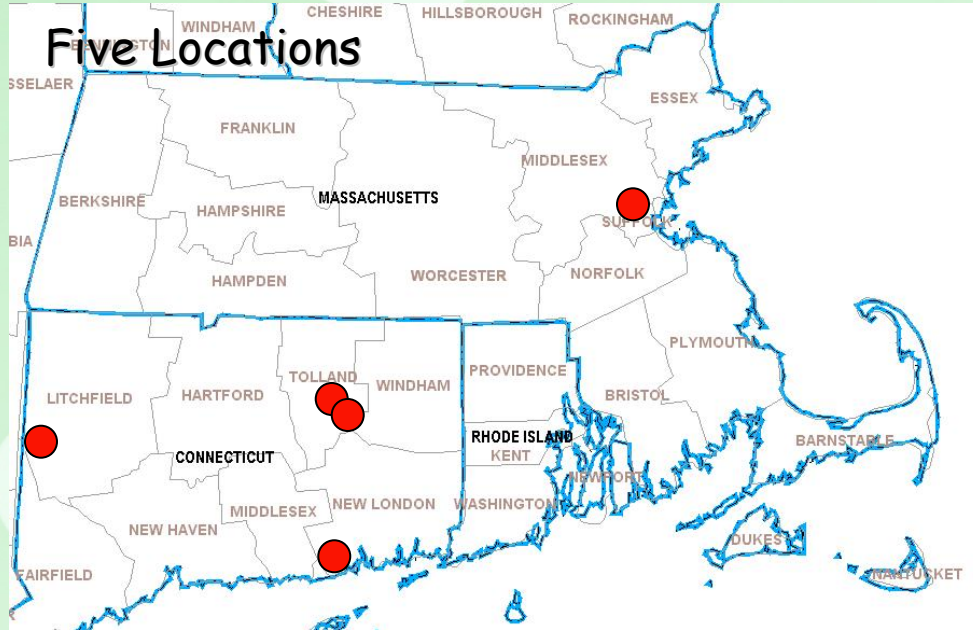
'Golden Ring'



'Monry' (Sunsation™)



To what extent has purple barberry escaped in southern New England

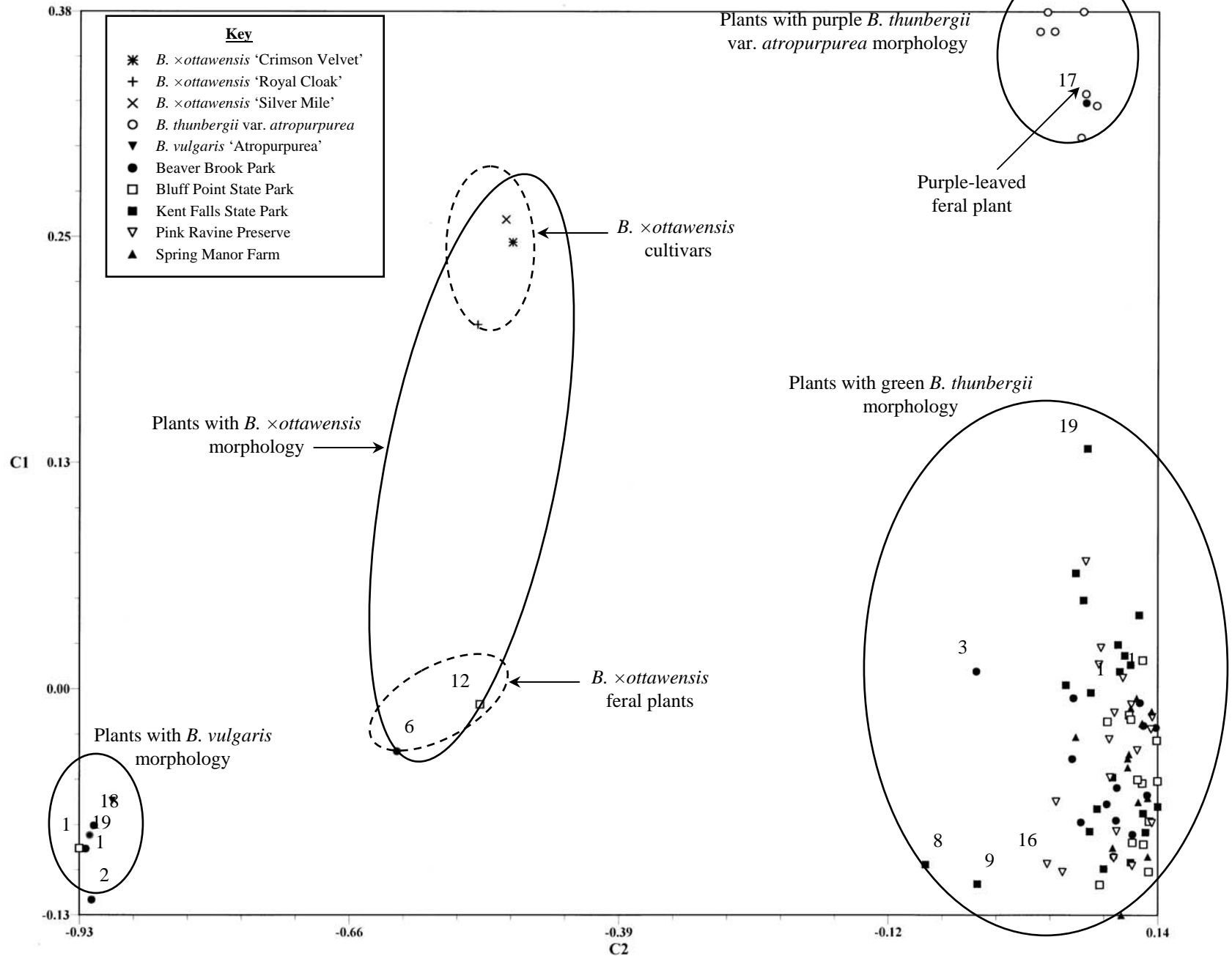


- 180 AFLP markers
- 85 feral plants



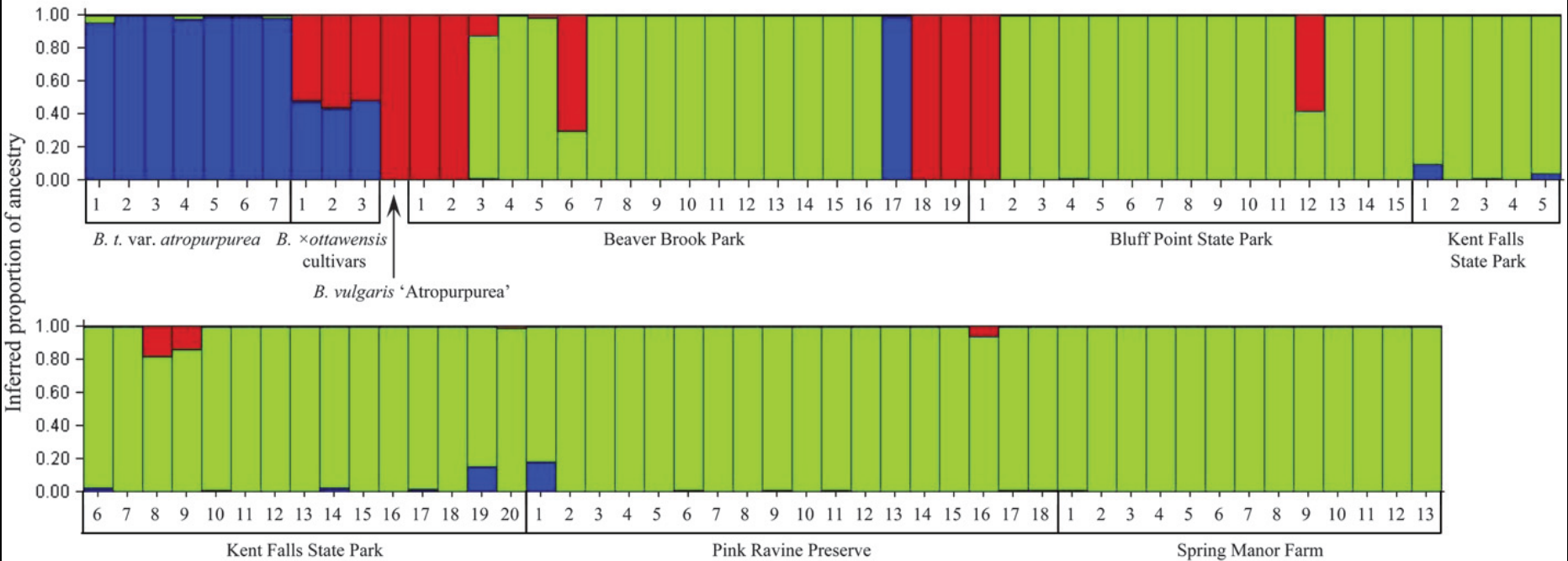


Principal Coordinates Analysis (PCOORDA) - Scatter plot



Bayesian Genetic Clustering

Key to Genotype Clusters
 Blue = *B. thunbergii* var. *atropurpurea*
 Green = *B. thunbergii*
 Red = *B. vulgaris*



What if someone plants purple barberry in their yard?
Is it a problem?

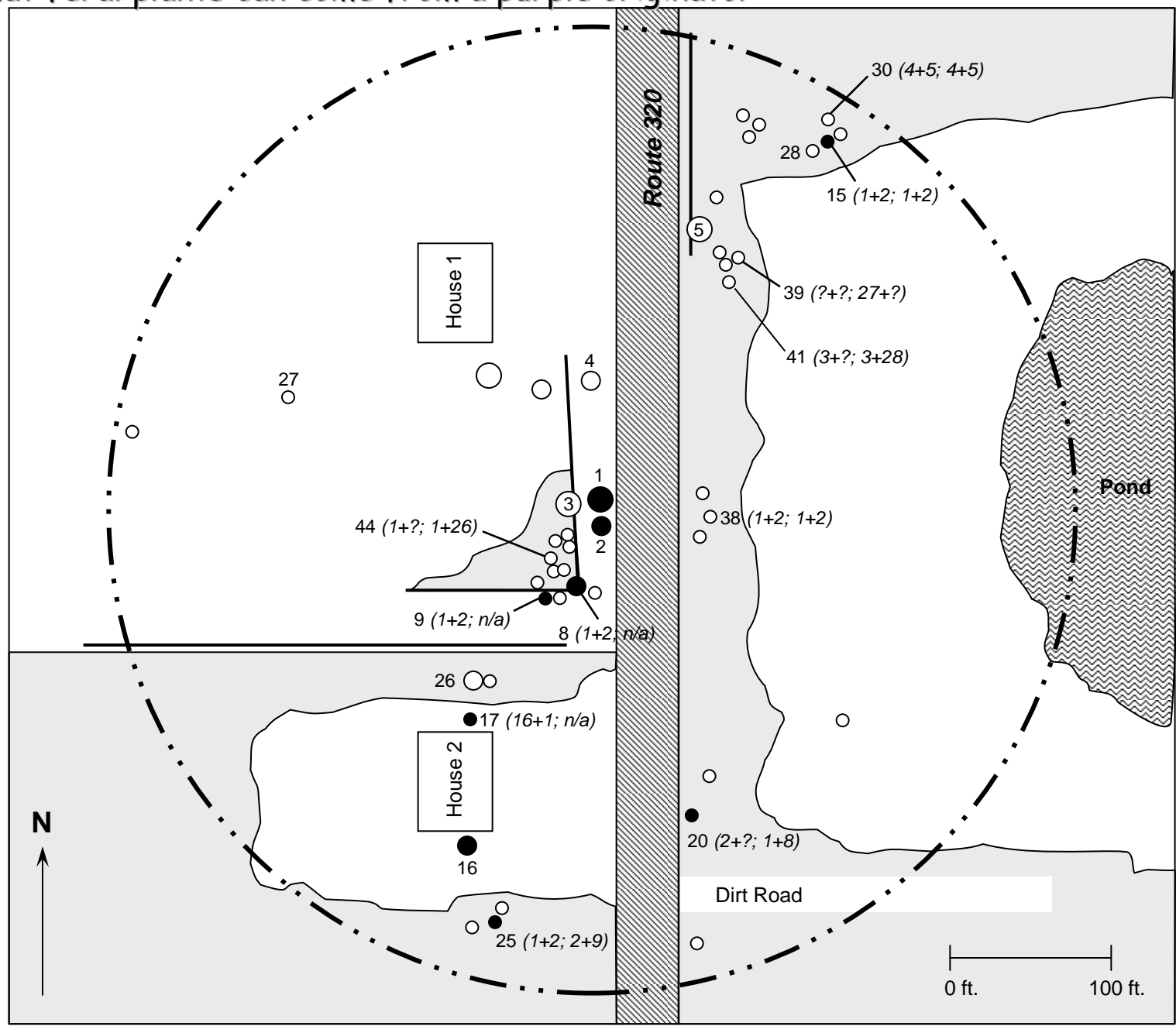
Track the genetic spread from a purple landscape barberry



Willington, CT

- 130 AFLPs and Parentage analysis (FaMoz) for every plant within 300 ft
- Evidence that feral plants can come from a purple originator

| Key | | |
|--------------|---------------|--------|
| Maturity | Green | Purple |
| Mature | ○ | ● |
| Early Mature | ○ | ● |
| Seedling | ○ | ● |
| Wooded Area | [Hatched Box] | |
| Grass Area | [White Box] | |
| Stone Wall | [Dashed Line] | |



Making Sterile Plants



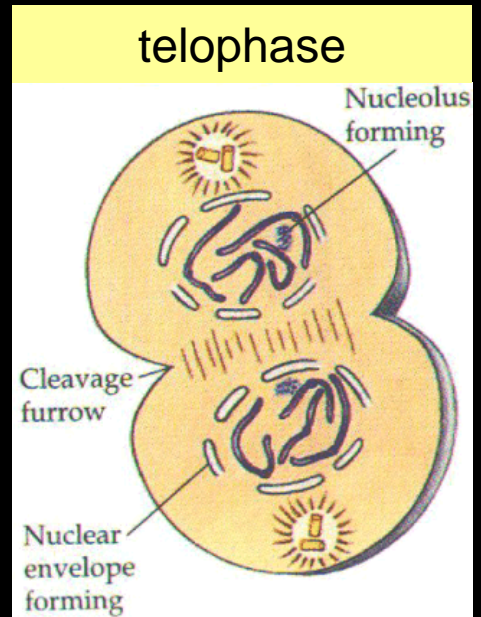
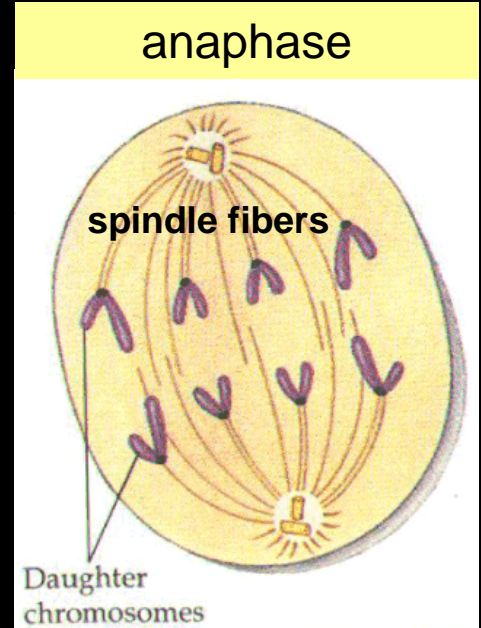
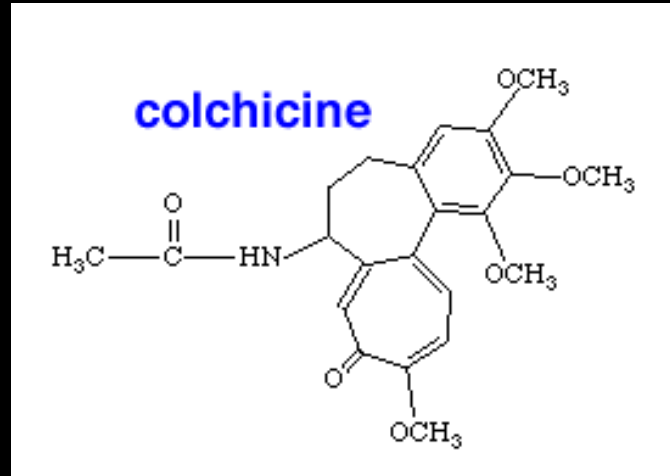
Examples of sterile triploids



Seedless watermelon



'Diana' hibiscus



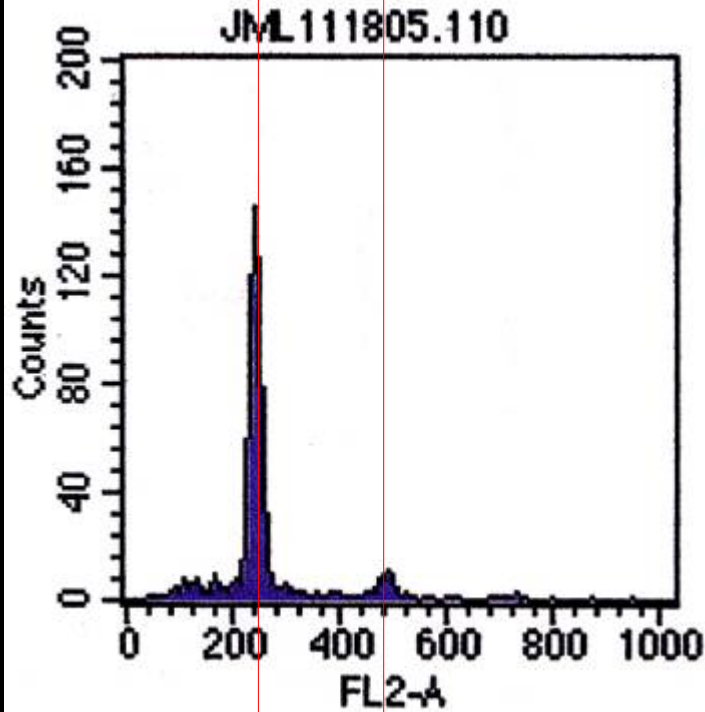


Tissue cultured shoot
nodal explants

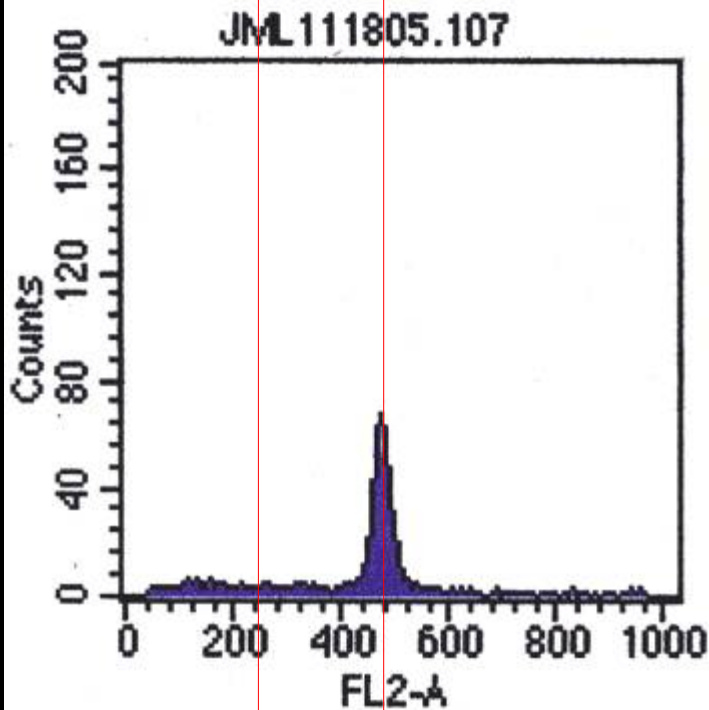


Stratified seeds

Berberis thunbergii
var. *atropurpurea*



Diploid



Tetraploid

Timeline for sterile barberry cultivars

| | |
|---|--------|
| Establish cultivars in tissue culture | 1 yr |
| Create tetraploids in vitro | 1 yr |
| Grow tetraploids to flowering size | 3 yrs |
| Tetraploids x diploids to produce triploid seedlings (embryo rescue?) | 1 yr |
| Evaluate triploids for sterility and ornamental characteristics | 5 yrs |
| Time to sterile barberry cultivars | 11 yrs |

