Table 3. Mineral element composition of rhododendron with B toxicity, 4 weeks following treatment.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>P (%)</th>
<th>K (%)</th>
<th>Ca (%)</th>
<th>Mg (%)</th>
<th>Na (%)</th>
<th>Mn (%)</th>
<th>Fe (%)</th>
<th>B (ppm)</th>
<th>Cu (ppm)</th>
<th>Zn (ppm)</th>
<th>Al (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CuSO₄ + limewater</td>
<td>.26</td>
<td>2.0</td>
<td>.62</td>
<td>.18</td>
<td>1.6</td>
<td>112</td>
<td>38</td>
<td>.41</td>
<td>97</td>
<td>97</td>
<td>24</td>
</tr>
<tr>
<td>ZnSO₄ + CuSO₄ + limewater</td>
<td>.26</td>
<td>2.0</td>
<td>.62</td>
<td>.18</td>
<td>2.0</td>
<td>119</td>
<td>33</td>
<td>49</td>
<td>2</td>
<td>117</td>
<td>16</td>
</tr>
<tr>
<td>CuSO₄ + ZnSO₄ + limewater</td>
<td>.26</td>
<td>2.0</td>
<td>.62</td>
<td>.18</td>
<td>2.0</td>
<td>85</td>
<td>34</td>
<td>43</td>
<td>22</td>
<td>70</td>
<td>14</td>
</tr>
<tr>
<td>Gypsum</td>
<td>.31</td>
<td>2.4</td>
<td>.68</td>
<td>.21</td>
<td>1.9</td>
<td>119</td>
<td>36</td>
<td>40</td>
<td>3</td>
<td>27</td>
<td>21</td>
</tr>
<tr>
<td>Cu(OH)₂ + limewater</td>
<td>.30</td>
<td>2.4</td>
<td>.63</td>
<td>.22</td>
<td>1.8</td>
<td>116</td>
<td>37</td>
<td>43</td>
<td>7</td>
<td>27</td>
<td>20</td>
</tr>
<tr>
<td>50 ppm P + (phosphoric acid)</td>
<td>.28</td>
<td>2.2</td>
<td>.71</td>
<td>.20</td>
<td>2.2</td>
<td>134</td>
<td>34</td>
<td>50</td>
<td>3</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>100 ppm P + (phosphoric acid)</td>
<td>.32</td>
<td>2.4</td>
<td>.71</td>
<td>.22</td>
<td>2.0</td>
<td>128</td>
<td>40</td>
<td>48</td>
<td>3</td>
<td>27</td>
<td>21</td>
</tr>
</tbody>
</table>

ZN plus limewater had 32 times more Cu than plants not receiving Cu. Plants treated with ZnSO₄ plus limewater had 5 times more Cu than all other plants not treated with Zn. With the exception of ZnSO₄ plus limewater all plants treated with limewater or CuSO₄ + H₂O (gypsum) had less foliar B than plants treated with phosphoric acid or pruning.

Our data indicate that pruning of the mature foliage exhibiting B toxicity symptoms during the fall season and treating with CuSO₄ + limewater resulted in plants of salable quality the following spring. A drench of Ca(OH)₂ and addition of gypsum to the medium reduced B uptake.


Polyplody in Evergreen Azaleas¹

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Additional index words. Rhododendron simsii, R. obtusum

Abstract. The chromosome number of 47 cultivars of Rhododendron simsii Planch. were all diploid (2n = 26) except 'Euratom' which was triploid (3n = 39). A number of R. simsii cultivars from China and Thailand, as well as R. indicum (L.) Sweet., R. tamurae (Makino) Masam., R. keiskei Miq., and R. kiusianum Makino were found to be diploid. The evergreen non-winterhardy azaleas which are grown as pot plants, are hybrids of Rhododendron indicum (L.) Sweet., R. tamurae and, principally, R. simsii. The Japanese azaleas used for forcing and as garden plants are descendants of R. kaempferi Planch., R. kiusianum Makino and R. satapenke Nakai. These species are indigenous to two centers of origin, viz., R. simsii to Southern China and the other species to Japan.

Although the efficiency of a breeding program is strongly promoted by the knowledge of the occurrence of polyplody in the genus, little research has as yet been undertaken for evergreen azaleas. Janaki Ammal et al. (3) investigated 360 of the 1,000 species of the genus Rhododendron but in their study of R. simsii R. eriicarpum Nakai was used. According to Ohwi (5) R. eriicarpum and R. tamurae are synonymous. This species resembles R. indicum but is markedly different from R. simsii. Consequently, some doubt exists whether R. simsii has actually been investigated, as it was difficult to obtain plants from China in 1950. This means that R. eriicarpum was probably studied instead of R. simsii. The specimen of R. simsii in our study came from the National Forestry Institute in Nanking through the good offices of the National Arboretum in Washington, D.C. who were also able to procure for us R. tamurae from Kurio, Japan, and R. indicum from Kosugedani, Yakushima. Another specimen of R. simsii came from Thailand, having been collected by Valder (7).

Pryor and Frazier (6) observed that the R. simsii cultivar 'Red Wing' was triploid. They believed 'Red Wing' to have been derived from 'Willem van Oranje' x 'Hexe'. 'Hexe' proved to be diploid but the ploidy of 'Willem van Oranje' was unknown as it was no longer found in the U.S.

A study of the ploidy of R. simsii cultivars and related species seemed justified because of the great commercial value of the evergreen azaleas in western Europe. Besides the above mentioned species and cultivars, many R. simsii cultivars were examined which came from a collection of 231 cultivars belonging to the Institute of Ornamental Plant Growing at Melle, described by Heursel (1). Samples were taken from flowering plants to check the authenticity of the cultivars.

Young root tips or apical meristems were fixed in 1:3 glacial acetic acid alcohol for 24 hr and then hydrolyzed in 1N HCl and stained in 1% orcein in 45% acetic acid. Chromosome counts on squash preparations were readily made using the same stain.


The diploid status of 'Red Wing' was surprising, and contrary to the findings of Pryor and Frazier (6).

In Belgium, the cross 'Apollo' x 'Hexe' produced the cultivar 'Euratom', which is triploid (2n = 39). Both parents are diploid. 'Casablanca tetra', imported from the U.S., is a tetraploid (2n = 52).

About 55% of the R. simsii assortment are mutants, containing not only flower-color mutants, but also flowers with strongly frilled edges and altered leaf shapes. Changes of ploidy level were checked to see if they could possibly be associated with the occurrence of sports.

The whole range of the Schame series was investigated, starting with the original cultivar 'Paul Schame' and continuing with 'Doblerug', 'Dresden', 'Eri', 'Jan Bier', 'Madame Bourlard', 'Madame Marcel De Paepe', 'Max Schame', 'Prines Beatrix', 'Schame alba', 'Schame Frise', 'Schame saumonla' and 'Werner Muckel'. All cultivars are diploid so no association could be detected between ploidy level and the appearance of sports.

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²We wish to express our gratitude to Dr. J. L. Creech of the U.S. National Arboretum in Washington, D.C. for providing a number of Rhododendron species.
Effect of Silver-thiosulfate Pretreatment on Vase Life of Cut Standard Carnations, Spray Carnations, and Gladiolus, after a Transcontinental Truck Shipment

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Additional index words. postharvest handling, ethylene, flower preservatives, Dianthus caryophyllus, Gladiolus x hortulanus

Abstract. Treatment of 'Scania' standard carnations and 'Elegance' spray carnations (Dianthus caryophyllus L.) with silver thiosulfate and the biocide Physan before shipment markedly extended shelf life in deionized water after arrival. The treatment extended vase life of 'Scania' and 'Elegance' 11.5 and 5.2 days, respectively, over controls. Pretreatment of 'Captain Busch' gladiolus (Gladiolus x hortulanus L. H. Bailey with silver thiosulfate alone or with a 10% sucrose pulse improved the quality of the spikes but did not extend vase life after shipment.

The adverse effect of ethylene on cut carnation flowers is well established (5, 9, 11) and ethylene is often a serious problem during their storage and transport. The sensitivity of cut carnations to ethylene can be reduced by proper temperature control (10), pulsing with sucrose solutions (9) and impregnating the stems with AgNO3 (7). These treatments, especially impregnation with AgNO3 combined with a pulse in 10% sucrose, proved very beneficial for air or truck-shipped flowers (4, 7). Silver ion has been shown to have a very pronounced antagonistic effect on horticultural crops (1) but is not transported up the stems of cut carnations (6).

Veen and van de Geijn (15) showed that the silver thiosulfate complex (STS) moves readily in the stem of carnation flowers, and this material has been used successfully to delay senescence of standard and miniature carnations (12, 13, 15). It is not known to what extent gladiolus flowers are sensitive to ethylene; some beneficial response to STS was found in laboratory experiments (2). The purpose of this study was to test the effect of STS pretreatment and a sugar pulse on the vase life of flowers following an actual or simulated transcontinental truck shipment.

Flowers. 'Scania' standard carnation, 'Elegance' spray carnation and 'Captain Busch' gladiolus flowers were obtained freshly cut in the morning from commercial growers and kept dry at 4°C until they were chemically treated the same day in Mountain View, CA.

Chemical treatment. STS solns containing 2 ppm silver were prepared as previously reported (12). Stems of standard carnations and gladiolus were immersed in the solution for 15 min, those of miniature carnations were immersed for 30 min (13). Control flowers were similarly pretreated in deionized water.

After pretreatment, carnations were transferred either to 200 ppm Physan, a quaternary ammonium compound (3) or to 200 ppm Physan plus 10% sucrose. Gladiolus stems were transferred to a pulsing solution containing 50 ppm silver nitrate, 300 ppm aluminum sulfate and 250 ppm 8-hydroxyquinoline citrate with 10% sucrose (8) or 200 ppm Physan. All flowers were held for 1 hr at about 26°C and were then transferred to a refrigerator for an additional 15 hr (overnight) at 4.4°C in the various solutions. The flowers were then divided into 2 lots and packed in standard cardboard half-boxes. One box was shipped in a refrigerated truck to Beltsville, Maryland. The temperature at packing was 21°C and the temperature of the flowers gradually fell to 4.4°C during the first 12 hr en route. Temperatures were measured by a Therma-Gard thermometer packed in the carton. The second box was brought to Davis, California stored at 5.6°C until the truck shipment arrived. When

Literature Cited