WATER QUALITY
WHY IT IS SO IMPORTANT FOR FLORISTS

Water is the most overlooked part of the fresh-cut flower handling process. Water and water quality often is taken for granted. Florists may buy the best flowers and floral preservatives, and have state-of-the-art processing equipment, but if they have low quality water, their flowers won’t last and customers will be unhappy. Water is expected to be pure and healthy for flowers, but that is not always the case. Water is an important part of flowers, making up 80 to 90 percent of flowers, and keeps them turgid or firm.

The properties or characteristics of water quality are:

1. pH
2. temperature
3. soluble salts
   a. alkalinity
   b. hardness

pH – Acid, Neutral, Base

pH often is described as acid, base or neutral, based on a scale of 1 to 14. A neutral pH is 7, an acid pH is less than 7 and a base pH is greater than 7. Most municipal water and well water is usually pH 8 to 9.

An acid pH of 3.5-5.0 is best for fresh-cut flowers.

Water with a low pH is taken up by the flowers more easily. The lower pH slows the growth of microbes that can slow or stop flowers from taking up water because they block the water conducting tissues of the flower stem. Flowers that quit taking up water have shorter vase lives. Citric acid is a safe organic acid that can be added to the water to acidify it.

Temperature

The best water temperature for flower handling is a warm 100°F.

Warm water contains fewer dissolved gases than cool water. The dissolved gas bubbles can cause blockages in the water conducting tissues in the flower stem just like microbes. Flowers also take up warm water better.

Soluble Salts

Unless water is pure, it will contain dissolved mineral salts. These affect the pH of the water and contribute to the hardness and alkalinity of the water. Total soluble salts (TDS) are made up of alkalinity, hardness and salinity. A low soluble salt content is best. Soluble salts can interfere with water uptake and cause burning on the tips of leaves and flowers. They also can interfere with the effectiveness of a floral preservative’s ability to lower the pH of the water.

Alkalinity

Alkalinity is a measure of water’s ability to neutralize or buffer acid. If it is too high, the pH of the water cannot be adjusted with a floral preservative. Alkalinity makes the floral preservatives

References


Special Thanks to

Dennis Hogan, SDK Laboratories, 1000 Corey Road, P.O. Box 886, Hutchinson, KS 67504-0886
Anne Schulter, Floralife, Inc., 751 Thunderbolt Drive, Waterboro, SC 29488

More Information

The number scale for pH is 1 to 14, which is the negative log of the hydrogen ion concentration in a solution. A solution with a pH of 14 has 1 x 10^-14 hydrogen ions per liter of solution.

Alkalinity measures the negative ion salts in water. It is measured as mg/liter Calcium Carbonate, CaCO3, equivalents or ppm Calcium Carbonate, CaCO3. The active ions are bicarbonate, HCO₃⁻; carbonate, CO₃²⁻; and hydroxide, OH⁻.

Hardness measures the positive ion salts in water. They usually are calcium Ca²⁺ and magnesium Mg²⁺. It usually is measured in parts per million, ppm. Most Kansas water sources have a high level of hardness because Kansas soils are high in calcium and magnesium.

When water is tested, the results usually will show a total soluble salts or total dissolved salts (TDS) number. This usually is expressed as ppm (parts per million) or mg/liter, or microsiemans. These units are not interchangeable.

1 ppm = 1 mg/liter = 700 microsiemans

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In each case, credit Karen Gast, Water Quality for Florists—Why is it so Important, Kansas State University, March 2000.

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

MP-2436 March 2000

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File code: Horticulture—11 (commercial)
Fluoride is a specific ion that can cause problems. It is often added to municipal water supplies to prevent tooth decay in humans. Flowers in the lily family and other monocots are more sensitive to fluoride than others. Floral preservatives often are formulated to remedy low water quality problems. pH adjustors are included to lower the pH to the optimum, and more acid is added to deal with "hard" water. Sometimes, the soluble salt content, fluoride levels, hardness, and alkalinity are so bad the florist will need to obtain a reverse osmosis, deionizing or distillation system to purify their water. Pure water has no contaminants, no soluble salts, no fluoride, and no buffering effect so floral preservative pH adjustors work well.

**TABLE 2. Fluoride Sensitivity for Select Flowers**

<table>
<thead>
<tr>
<th>Flower</th>
<th>Toxic Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freesias</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Gladiolus</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Gerberas</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Mums</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Snapdragons</td>
<td>5 ppm</td>
</tr>
<tr>
<td>Roses</td>
<td>5 ppm</td>
</tr>
</tbody>
</table>

**Floral Preservatives**

Floral preservatives often are formulated to remedy low water quality problems. pH adjustors are included to lower the pH to the optimum, and more acid is added to deal with "hard" water. Sometimes, the soluble salt content, fluoride levels, hardness, and alkalinity are so bad the florist will need to obtain a reverse osmosis, deionizing or distillation system to purify their water. Pure water has no contaminants, no soluble salts, no fluoride, and no buffering effect so floral preservative pH adjustors work well.

**Water Testing**

Florists need to have their water tested by an independent water testing laboratory to determine the problems and how to remedy them. Many water "conditioning" companies that sell water purifying equipment have laboratories. Consult the local yellow pages or call the local county K-State Research and Extension office for the nearest water testing laboratory. Some floral preservative companies conduct water testing—Floralife of Waterboro, South Carolina, conducts water testing and has a line of products for various water qualities. Florists should request testing on alkalinity, hardness, pH, total dissolved salts/solids and fluoride. Let the water run a few minutes before taking a sample of 8 ounces or so, in a clean container. The laboratory may have sample bottles, too. Florists also should send a water sample with their floral preservative prepared in it.

**Other Water Quality Problems**

Fluoride is a specific ion that can cause problems. It is often added to municipal water supplies to prevent tooth decay in humans. Flowers in the lily family and other monocots are more sensitive to fluoride than others. Fluoride toxicity is more of a problem at a lower pH, which is best for holding fluoride in the water. To make the floral preservative more effective, an acid like citric acid should be added instead. Floral preservatives often are formulated to remedy low water quality problems. pH adjustors are included to lower the pH to the optimum, and more acid is added to deal with "hard" water. Sometimes, the soluble salt content, fluoride levels, hardness, and alkalinity are so bad the florist will need to obtain a reverse osmosis, deionizing or distillation system to purify their water. Pure water has no contaminants, no soluble salts, no fluoride, and no buffering effect so floral preservative pH adjustors work well.

**TABLE 1. Toxic Soluble Salt Levels for Selected Flowers**

<table>
<thead>
<tr>
<th>Flower</th>
<th>Toxic Soluble Salt Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glads</td>
<td>700 ppm</td>
</tr>
<tr>
<td>Roses</td>
<td>300 ppm</td>
</tr>
<tr>
<td>Mums</td>
<td>200 ppm</td>
</tr>
<tr>
<td>Carnations</td>
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Comments: For this water sample, the standard floral preservative is adequate. The pH is lowered appreciably to the acceptable level. This was due to the fact that the lower alkalinity and hardness of the water enabled the pH adjusters to work effectively.

TABLE 3. Sample water testing report.

<table>
<thead>
<tr>
<th>Sample Water Laboratory</th>
<th>Anywhere, KS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample #</td>
<td>9999</td>
</tr>
<tr>
<td>Sample</td>
<td>Water Sample</td>
</tr>
<tr>
<td>Date Received</td>
<td>9/8/99</td>
</tr>
<tr>
<td>Date Reported</td>
<td>9/11/99</td>
</tr>
<tr>
<td>Fee</td>
<td>$10.00</td>
</tr>
</tbody>
</table>

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TABLE 3. Sample water testing report. This is a water sample without floral preservative. Comments are noted beside each water quality component. Most water laboratories do not have recommendations for florists—the florist will need to interpret them using guidelines in this publication.

<table>
<thead>
<tr>
<th>pH</th>
<th>TDS mg/l</th>
<th>Alkalinity mg/l</th>
<th>Hardness mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.60</td>
<td>1217</td>
<td>400</td>
<td>360</td>
</tr>
<tr>
<td>6.60</td>
<td>1524</td>
<td>240</td>
<td>440</td>
</tr>
<tr>
<td>7.77</td>
<td>570</td>
<td>220</td>
<td>80</td>
</tr>
<tr>
<td>6.36</td>
<td>837</td>
<td>180</td>
<td>220</td>
</tr>
<tr>
<td>8.28</td>
<td>613</td>
<td>120</td>
<td>160</td>
</tr>
<tr>
<td>4.54</td>
<td>504</td>
<td>10</td>
<td>140</td>
</tr>
<tr>
<td>5.97</td>
<td>90</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>4.33</td>
<td>336</td>
<td>20</td>
<td>180</td>
</tr>
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TABLE 4. Results of water tests on four different water samples before and after adding a standard floral preservative. First, check the alkalinity recommendation—high alkalinity usually means it will be hard to adjust the pH. Information in this table was provided by Floralife, Inc.

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 1</td>
<td>7.60</td>
<td>6.60</td>
</tr>
<tr>
<td>Sample 2</td>
<td>7.77</td>
<td>6.36</td>
</tr>
<tr>
<td>Sample 3</td>
<td>8.28</td>
<td>4.54</td>
</tr>
<tr>
<td>Sample 4</td>
<td>5.97</td>
<td>4.33</td>
</tr>
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Karen L. B. Gast

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