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SOIL INCORPORATION OF GYPSUM AND IRRIGATION WATER ACIDIFICATION TO COUNTER DETRIMENTAL EFFECTS OF SODIUM AND BICARBONATES ON RABBITEYE BLUEBERRIES

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INTRODUCTION

Texas blueberry growers must often rely on supplemental irrigation during the summer to supply their plants with sufficient water. Available water sources include pond water and well water. Next to rain water, pond water is usually the best quality irrigation source, since it is often acidic and low in salts. However, many growers do not have a pond on their property, or do not have sufficient pond water to last throughout the summer.

Shallow wells (30-90 ft) in East Texas contain good quality water but have insufficient quantity for summer-long irrigation. Adequate supplies of deep well water are often of poor quality. Ions such as sodium, chloride, and bicarbonate occur in this water at sufficiently high levels to injure blueberries. Sodium may cause leaf necrosis (drying and eventual death of leaves) and slow growth, while bicarbonates may lead to high soil pH. Blueberry plants respond to high soil pH by exhibiting iron chlorosis (yellowing of the younger leaves). Bicarbonates may be eliminated from irrigation water through the injection of acid. Sulfuric, hydrochloric or phosphoric acids are usually used because of their low cost, but any acid may be used. Research on other crops has indicated that the detrimental effects of sodium may be countered through the application of calcium. Gypsum (CaSO_4) is a good source of calcium, since it will not raise the pH of soil or water and contains no harmful anions such as Cl^- which may be detrimental to blueberries.

MATERIALS AND METHODS

This study was conducted at the Texas Agricultural Experiment Station at Overton. It was designed to determine if irrigation with acidified well water was equivalent to irrigation with pond water, and if the application of gypsum to the soil would counter possible detrimental effects of sodium in the acidified irrigation water. Two water treatments were used, pond water and acidified well water. Well water contained 4 meq/liter (224 ppm) bicarbonates and was acidified with acetic acid.

Analysis of the water treatments and Wilcox aquifer well water is shown in Table 1. Gypsum treatment consisted of 4 levels: 0, 0.75, 1.5 and 3 lbs per plant. Each level was applied in 3 equal portions, the first when supplemental irrigation began (1 July), and again one and two months later. Gypsum was applied to the soil around the plant, and mixed with the topsoil. Each water treatment was applied to 20 plants, and within those 20, each gypsum treatment was applied to 5 individual plants. Photosynthesis and transpiration (water loss through stomates) were measured for each blueberry plant. Measurements were taken initially during the 1st week of August, and then subsequently about 30 and 60 days later.

RESULTS AND DISCUSSION

Results indicated no difference in photosynthesis or transpiration due to gypsum treatment regardless of when measurements were taken (data not shown). Water analysis indicated that the sodium level following acidification was not high enough to cause damage (Table 1).

Results also indicated that photosynthesis and transpiration were not affected by water treatment. Previous work indicates that irrigation with non-acidified, high bicarbonate well water causes severe chlorosis to blueberry plants. However, no effect of calcium or water treatment on leaf chlorosis was noted in the present study. This suggests that acidification of well water eliminated any harmful effects of bicarbonates. Acidification may aid in improving irrigation water to a quality suitable for blueberry growth when bicarbonate levels are a cause of concern.

Table 1. Nutrient analysis and sodium adsorption ratio (SAR) of water treatment and non-acidified well water.¹

	Calcium (ppm)	Magnesium (ppm)	Sodium (ppm)	Chlorine (ppm)	Bicarbonates (ppm)	SAR
Pond Water	12.69	7.95	6.05	18.00	54.84	0.33
Acidified Well Water	8.73	3.22	53.59	12.00	0.00	3.94
Well Water	8.19	2.92	48.92	13.00	244.00	3.74

¹Non-acidified well water analysis is presented for comparison, but was not included as a study treatment.