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The effects of pH water on Mg^{2+}, $Fe^{2+}$and chlorophyll content of the geranium flowers

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ABSTRACT

The study was performed by using a factorial experiment in a randomized complete block design with three replications at the research greenhouse, of Ilam University. The effects of acidification of the irrigation water were examined on Mg^{2+}, $Fe^{2+}$and chlorophyll content. Treatments consisted of six level acidity of irrigation water (A_1: pH=4, A_2: pH=4.5, A_3: pH=5, A_4: pH= 5.5, A_5: pH=6, A_6 (water) pH =7.8) and two cultivar of red and white flower geranium. The results showed that acidification of irrigation water was significantly increased leaf Mg^{2+}, $Fe^{2+}$and chlorophyll content. It is recommended that in areas with high soil pH and EC, acidity of irrigation water as much as pH=5.5 by using of substances such as nitric acid, phosphoric acid, sulfuric acid, enhance the quantity and quality of flower.

Key words: pH water, Geranium flowers, Mg^{2+}, $Fe^{2+}$and chlorophyll

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INTRODUCTION

Soil chemical properties should be such a high cation exchange capacity, appropriate pH, EC. Flowers are very sensitive to soil pH and flourish is in specific range of reactions and the ability to absorb nutrients is influenced by soil pH [1]. Water is acidic or alkaline. Water-molecules can react with an alkali such as ammonia, and protons are released from them pH has a dramatic effect on the usability of ions of different elements. Outside the optimum range of pH, higher or lower, is causing problems. Low pH increases the solubility of excess iron and manganese, which toxicity results in Amaranthus, parsley and Geranium [2]. Resistance rate to neutralize the acid solution depends on the concentration of alkali-soluble [3]. Alkalinity associated with the buffering capacity of the water. Less than 2 mEq /l is safe for most products [4].

Excess amounts of nitrogen will decrease the growth of geranium. Geraniaceae is sensitive to ammonia toxicity, and causing twist, chlorosis and necrosis in old leaf [5]. Ammonia toxicity in geranium can destroy by more than 75% nitrogen in the form of nitrate. Nitrogen can be used in local geranium at 250-200 ppm. However, geranium torpedo require less amount.

The best source of nitrogen for geranium is fertilizer 20-10-20 and 15-5-25 calcium nitrate, potassium nitrate, ammonium nitrate [6]. Leaf nitrogen content in geranium cuttings is 3.8 -4.4 ppm, 3-3.2 ppm in geranium torpedo and 3.7-4.8 ppm in seedling [5]. Potassium is involved the role of stomatal and resistance to diseases in Geranium [7]. The amount of ammonium may also reduce the absorption of calcium, or movement within the plant which causing concern in geranium [4]. Soil pH may be causing use too much iron and manganese and thus leads their toxicity or deficiency symptoms [3, 8].

MATERIALS AND METHODS

The study was performed by using a factorial experiment in a randomized complete block design with three replications at the research greenhouse of Ilam University. A factor was two varieties of geranium and factor B consisted of 6 levels water with pH=7.8 (tap water or Control) and pH=4, 4.5, 5, 5.5, 6. Considering to the variety of geranium cultivars with different characteristics, red and white flowers was selected. Apical cuttings were collected with the same size and length of healthy shoots. After removing the leaves from the lower half of the cuttings, they were transferred to rooting medium. Rooted cuttings were moved into pots. Dry soil was sprayed with water. Bed temperature was regulated about 3-5 ° C above ambient temperature. Nearly 1.5 month later, they were transplanted into pots and the treatments were applied. Soil was: 1) two parts garden soil (soil in the Quchali area) 2) a portion of rice bran 3) a portion of animal manure 4) a portion of washed sand. . A sample was sent for analysis to the laboratory of the Institute of Soil and Water. To determine the chemical properties sample of the water sent to the laboratory of water and municipal wastewater. To neutralize the SAR, 100 nitric acid dilutions were added. 111, 141, 159, 169.5 and 177Ml nitric acid were added to 30 l water.

To determine the content of the leaf tissue, tips were removed from the end of shoot leaves and were washed with distilled water. After exposing to air dry, they were dried for 24 hours in oven at 80°c. Content of the leaf tissue was determinate according to AOAC methods at Analytical Chemistry Laboratory, Faculty of Science, and University of Ilam.

Data was analyzed by using SPSS and SAS software and means were compared by Duncan Test.

RESULTS AND DISCUSSION

The effect of acidifying of water irrigation on leaf chlorophyll content

Comparison of means of chlorophyll content in the leaf tissue showed different levels of water acidity, there was most significant difference between the treatment and control ($p \leq 0.01$). The most significant differences are shown with acidified water treatment which was placed in separate classes. Acid to neutralize the SAR treated with water irrigation and A_6 to A_4 increased, but the downward trend was observed after treatment A_3. The highest and lowest levels of chlorophyll was recorded in treatment A4 (2.22 ^{a}) and treated with A6 (9.2 ^{c}) respectively (Charts 1). These results are consistent with the findings of Motalebi fard (2000) [9].

Interpretation of the results shows that neutralize SAR and acidity of the irrigation water increases the solubility of magnesium that is the core of chlorophyll. It is therefore increasing the uptake by plants, chlorophyll content rises. The significance of the effect of the amount of chlorophyll and comparison of the two cultivars used, been proved there was a significant difference between the mean values of these the two cultivars; Red geranium flower (19.5^{a}) was higher than white flower geranium (18.3^{b}). The red geranium flower grows foliage, plant height and leaf area than the white flower that is probably due to the genotype (Charts 2).

The effect of acidifying of the irrigation water on the amount of iron content in leaf

According to the analysis of variance, interaction of irrigation water acidity and cultivar type, increased iron content in leaf tissue and differences among treatments were significant at one percent level. SAR neutralization with acidity of the water, Iron content of the treatment A_6 to A5 has rising trend, but at treatment A1 downtrend was observed. The highest and lowest iron content in the leaf tissue was seen combination of white flowers and A_5 (170 ^{a} ppm) and red with A_6 (101.2 ^{f} ppm).

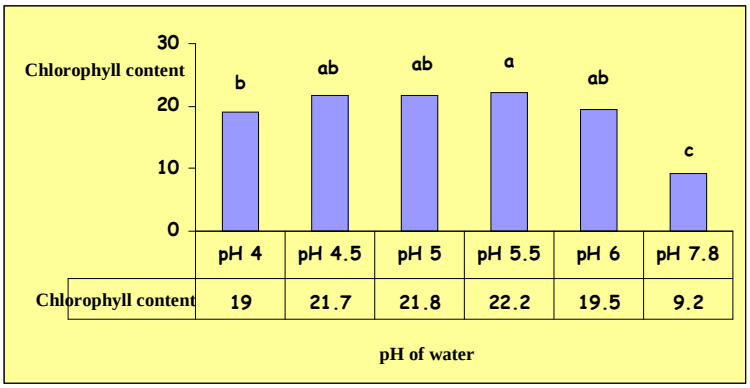
Kalbasi (1988) reported increasing the solubility of Iron in the clay soil saturation extract. Motalebi Fard (2000) and Seidi (2002, 2008) increased carnation leaf iron content by acidification of the water [9, 3, 10].

Interpretation of the results shows that neutralize SAR and acidity of the irrigation water increases the solubility of Iron, manganese, zinc, copper and aluminum, resulting in increased levels of iron plant (charts 3).

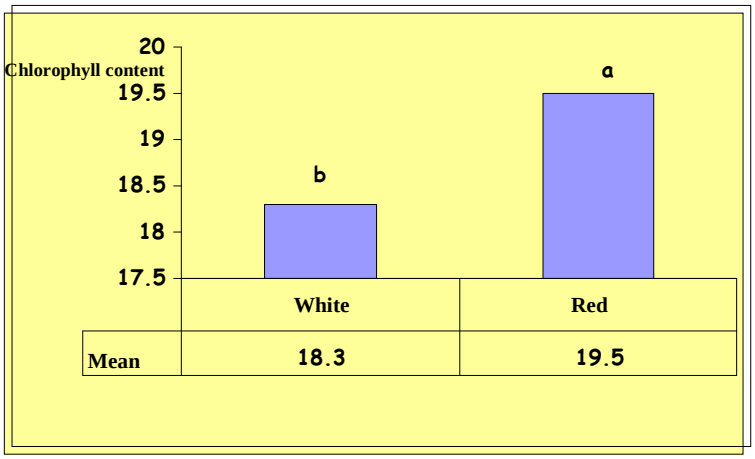
The effect of acidifying of the irrigation water on the amount of magnesium content in leaf

Comparison of means of chlorophyll content in the leaf tissue showed different levels of water acidity; there was most significant difference between the treatment and control ($p \leq 0.01$), (Charts 4).The most significant differences are shown with acidified water treatment which was placed in separate classes. The most significant differences are shown with acidified water treatment which was placed in separate classes. Acid to neutralize the SAR treated with water irrigation and A_6 to A_5 increased, but the downward trend was observed after treatment A5. The highest and lowest levels of chlorophyll was recorded in treatment A_5 (34 ^{a}) and treated with A6 (29 ^{c}) respectively. Mg^{2+} content increases with decreasing leaf water pH and neutralization SAR which could be due to the increasing

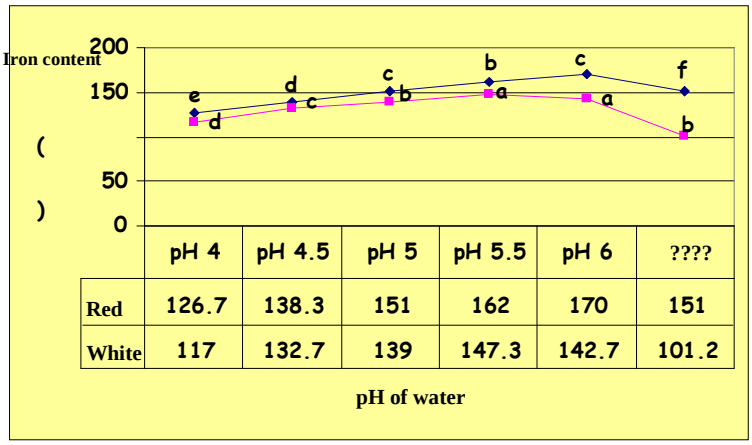
mobility and accessibility. These results are agreed with Seidi (2002, 2008) and there was compatible with of Motalebi fard findings (2000), [3, 10, 9].



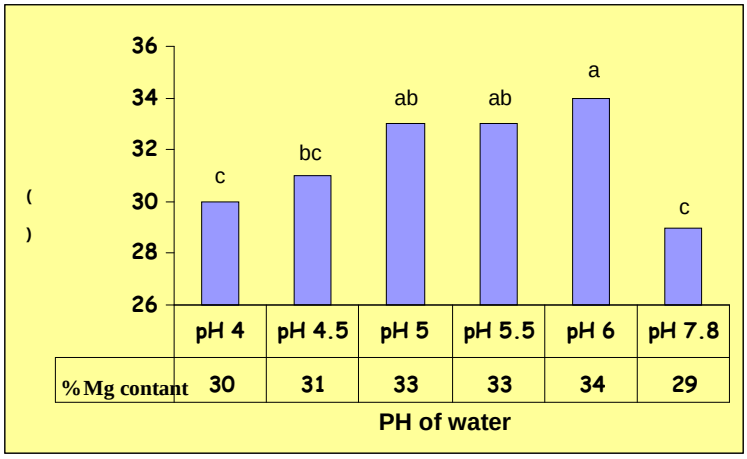
Charts 1.The effect of acidifying of water irrigation on leaf chlorophyll content



Charts 2.The effect of acidifying of water irrigation on leaf chlorophyll content



Charts 3.The effect of acidifying of water irrigation on leaf Fe^{2+} content



Charts 4.The effect of acidifying of water irrigation on leaf Mg^{2+} content

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