GROWTH AND LEAF MINERAL CONTENT OF BALADY PEACH SEEDLINGS AS AFFECTED BY MAGNESIUM SULFATE SPRAYS

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"تأثير الرش بسلفات المغنسيوم على النمو والمحتوى المعدنى لشتلات الخوخ البلدى"

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ملخص البحث

أجريت هذه الدراسة لموسمين متتاليين ٨٦ ـ ١٩٨٧ على شتلات الخوخ البلدى وذلك لدراسة تأثير رش سلفات المغنسيوم على النمو الخضرى ومحتوى الأوراق من العناصر ـ حيث زرعت فى أصص ٣٠ سم مملوءة بمخلوط من الرمل والبيت بنسبة ١ : ١ بحيث كل بذرة فى أصص، وتم ريها بالماء ومحلول هوجلاند بدون مغنسيوم وبدأت المعاملات بعد أسبوع واحد من انبات حوالى ٥٠٪ من البذور ٠

حيث أعطيت مجموعة واحدة من هذه النباتات محلول هوجلاند به جميع العناصر (معاملة عن طريق الجذور) بينما المجاميع الباقية أعطيت محلول هوجلاند ولكن بدون مغنسيوم وهذه المجاميع رشت على النحو التالى :ـ

١ ـ شتلات بدون سلفات مغنسيوم
٢ ـ شتلات ٠,٢٥ ٪ سلفات مغنسيوم
٣ ـ شتلات ٠,٥٠ ٪ سلفات مغنسيوم
٤ ـ شتلات ١ ٪ سلفات مغنسيوم

وكان الرش يتم مرتين كل أسبوع ولمدة ١٠ أسابيع متتالية

وكان تصميم التجربة بالقطاعات الكاملة العشوائية بخمس مكررات كل مكرر ٣ شتلات ٠

وجمعت النباتات بعد ١٠ أسابيع من بداية المعاملات وقبل الجمع تم قياس عدد الأوراق لكل شتلة وارتفاع الشتلة والنقص فى المغنسيوم ونسبة الأوراق التالفة ونسبة الأوراق المتساقطة ٠

وعند الجمع تم أخذ الأوراق لتقدير العناصر المختلفة ٠

وتم التوصل الى النتائج الآتية :ـ

١ ـ أدى الرش بالمغنسيوم الى تقليل نقص المغنسيوم فى الشتلات ٠

٢ ـ أدى الرش بالمغنسيوم الى زيادة تركيز المغنسيوم فى أوراق الشتلات بالاضافة الى زيادة نمو الشتلات عند مقارنتها بالنباتات النامية بدون مغنسيوم ٠

٣ ـ كان النمو الخضرى ومحتوى الأوراق من المغنسيوم أقل وبصورة واضحة فى الشتلات المعاملة بالرش عن الأخرى المعاملة عن طريق الجذور ٠

٤ ـ بمقارنة النباتات المعاملة عن طريق الجذور بالأخرى الغير معاملة بالمغنسيوم أدى ذلك الى زيادة تركيز الفوسفور والبوتاسيوم والنحاس والزنك بينما أدى الى تقليل الكالسيوم والمغنسيوم ولم يحدث أى تأثير بالنسبة للحديد والمنجنيز والبورون والألمونيوم ٠

٥ ـ أدى نقص المغنسيوم الى زيادة اختلال التوازن الغذائى ولكن أمكن تخفيف حدته عن طريق الرش بالمغنسيوم

ABSTRACT

Foliar application of Mg (0.0%, 0.25%, 0.50%, or 1% $MgSO_4 . 7H_2O$) was compared to root-supplied Mg (Hoagland's solution) in Balady peach (Prunus persica (L.) Batsch) seedlings. Foliar-applied Mg suppressed but did not prevent Mg deficiency symptoms and increased leaf concentration of Mg and seedling growth compared to that one had no Mg application. Leaf Mg and growth resulted from foliar sprays were subtantially less than that plants with root-supplied Mg. Compared to root-supplied Mg, omitting Mg increased the leaf concentration of P, K, Cu, and Zn; decreased Ca and Mg and had no effect on N, Fe, Mn, B, and Al. The nutritional imbalances induced by Mg deficiency were alleviated by foliar applied Mg.

INTRODUCTION

Magnesium deficiency in peach can be a problem in acid soils and in some alkaline soils. Deficiency symptoms can be expected to occur when leaf Mg fall below about 0.20% (Sharpe et al., 1951). Subsequently, acid soils growers corrected Mg deficiency by liming routinely with dolomitic limestone.

In the acid soils, correction of Mg deficiency can be delayed by about one year following lime application. Infrequently, the delay may be longer. During this lag in correction of Mg deficiency, foliar application of Mg has potential use. Consequently, this study was carried out to: (1) determine the degree to which the Mg requirement of peach can be satisfied by foliar sprays of Mg and (2) determine the effect of Mg sprays on leaf elemental conentration.

MATERIALS AND METHODS

The study was carried out for two successive seasons of 1986 and 1987 at the experimental orchard, Hort. Dept., Faculty of Agric., Shebin El-Kom. Stratified seeds of Balady peach were planted according to Hartmann and Kester (1975). In the greenhouse in 30-cm pots filled with rooting media (qual parts of peat and sand). One seed was planted per pot, Water and Hoagland's solution with Mg omitted (Hoagland and Armon, 1950) were applied as described by Sparks (1978). One week after 50% of germination, five differential Mg treatments began. At this time, all seed had germinated, and most of the seedlings were at the 2 leaf stage, although on a few seedlings, the leaves were unfolded. One group of plants received a complete Hoagland's solution. Four other groups continued to receive Hoagland's solution without Mg. In addition, the foliage of the four minus Mg group was sprayed with a 0.00%, 0.25%, 0.50% and 1% solution of Mg SO_4 . $7H_2O$ plus a wetting agent (3 ml. detergent/1 liter of solution). Foliar sprays were applied twice per

a week for 10 consecutive weeks. The leaves were sprayed to runoff on both the lower and upper surfaces. Plants were harvested at 10 weeks following treatment initiation. Prior to harvest, leaves per plant, seedling height, and notations as to Mg deficiency symptoms were recorded. Deficiency rate were made using a scale of 1 to 5 with 1 = no deficiency symptoms and 5 = severe deficiency symptoms.

In addition, percentage of leaves scorched and defoliated from Mg deficiency were determined. At harvest, the leaves, trunk, and roots were separated washed (1 min. in a detergent followed by a distilled water rinse), air-dried, oven-dried for 72 hr. at 70°C, and weighed. The leaves were ground, re-dried, and analyzed for N and P by standard A.O.A.C. (1975) procedures, K was determined utilizing a flame spectrophotometer (Yamaguchi and Minges, 1956) and Ca, Mg, Fe, Mn, B, Cu, Zn, Al, and Na were determined by using a Perkin-Elmer model 372 atomic absorption spectrophotometer (Buckanan and Muraoka, 1964).

The experimental design was a randomized complete block replicated 5 times with 3 seedlings per plot (i.e., 15 plants per treatment).

RESULTS AND DISCUSSION

Investigating the influence of foliar applied Mg on plant growth illustrated that omitting Mg induced Mg deficiency symptoms (Table 1). All indices of Mg deficiencies were decreased with foliar applied Mg, but Mg deficiency was not prevented at the highest spray concentration of Mg So_4 . It is clear that general spraying foliage with Mg So_4 increased seedling dry weight (Table 1) and raised the Mg concentration in the leaf (Table 2) when compared to plants grown without Mg, in both seasons. Foliar applied Mg, however produced shorter seedlings with fewer leaves and substantially less dry weight

Table (1) : Effect of foliar applied Mg on growth characteristics of seedling Balady peaches

Method of supplying Mg.	Deficiency rate .	Defoliation (%)	Scorched leaves (%)	Leaves/seedling (No.)	Seedling ht (cm).	Dry weight/seedling (g) .
			1986			
Foliar spray						
0.00 %	5.0	50	90	8.8	23	45
0.25 %	3.7	13	84	9.4	20	50
0.50 %	2.8	9	79	8.6	21	55
1.00 %	2.2	7	55	8.9	22	70
Root	1.0	0	0	11.3	35	151
New L.S.D. at 5 % .	0.85	1.30	1.80	0.75	3.20	2.65
			1987			
Foliar spray						
0.00 %	5.0	45	81	7.9	20	41
0.25 %	3.3	11	75	8.4	18	44
0.50 %	2.5	8	71	7.7	18	49
1.00 %	2.0	6	49	8.0	19	63
Root	1.0	0	0	10.1	31	135
New L.S.D. at 5 % .	0.55	2.20	3.10	0.60	2.60	2.45

Table (2) : Effect of foliar applied Mg on the elemental concentration of Balady peach leaves .

Method of supplying Mg.	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	Fe (ppm)	Mn (ppm)	B (ppm)	Cu (ppm)	Zn (ppm)	Al (ppm)	Na (ppm)
1986												
Foliar spray												
0.00 %	2.88	0.42	2.68	1.65	0.05	80	285	47	6.4	35	78	50
0.25 %	3.31	0.33	2.42	1.73	0.12	68	356	55	7.2	34	55	78
0.50 %	3.19	0.35	2.40	1.85	0.16	75	408	61	7.0	33	68	64
1.00 %	3.07	0.30	2.28	1.84	0.19	62	357	56	5.8	27	61	64
Root	2.89	0.26	1.34	1.92	0.54	58	247	39	5.2	14	80	39
New L.S.D. at 5 % .	0.60	0.11	1.05	0.20	0.30	1.2	2.5	1.8	0.8	3.2	0.75	2.1
1987												
Foliar spray												
0.00 %	2.59	0.37	2.41	1.48	0.05	72	256	42	5.7	31	69	45
0.25 %	2.97	0.30	2.17	1.55	0.11	61	320	49	6.5	29	49	70
0.50 %	2.87	0.31	2.16	1.66	0.14	67	367	54	6.1	28	61	57
1.00 %	2.76	0.27	2.05	1.63	0.16	55	321	50	5.2	24	55	55
Root	2.61	0.21	1.20	1.71	0.47	52	222	35	4.7	13	71	35
New L.S.D. at 5 % .	0.45	0.12	1.10	0.15	0.21	2.8	3.4	3.0	0.65	3.4	1.2	2.7

than plants grown with root supplied Mg (Table 1). Furthermore, the Mg concentration in leaves of plants grown with root supplied Mg was higher than in leaves of sprayed plants (Table2). These results (Tables 1 and 2) demonstrated that foliar application of Mg So_4 can partially satisfy the Mg requirement of Balady peaches in the two seasons of study. Spraying plants with 1% solution of Mg So_4 resulted in a substantial increase in leaf Mg concentration of 0.19% and 0.16% compared to 0.05% and 0.045% in leaves from plants grown without additional Mg in the first and the second seasons, respectively. Consequently, in moderate to mild cases of Mg deficiency (i.e., 0.14% and 0.115% Mg and greater in the leaf) spraying theoretically could prevent visual Mg deficiency during a lag period following soil applications of dolomitc limestone or other Mg fertilizer. Furthermore, the exponential relationships between seedling growth responsed to sprays would be greater in trees with moderate than with severe deficiency (Fig. 1). A potential problem in extrapolating these data to field conditions is that most peach orchards are not sprayed 20 times per season as in this study. Thus, unless Mg uptake by the peach leaf is substantially greater during its early stages of development as in apple (Cook and Boynton, 1952; Fisher and Walker, 1955), response obtained under field conditions is expected to be less than that indicated in Tables (1 and 2).

Worley et al. (1975) and Worley and Littrell (1980), working under field conditions, failed to increase Mg in pecan leaves from foliar sprays, however, he applied Mg only 1 to 2 times per season. The response to sprays possibly may be enhanced by the use of Mg sources which promoted the leaf uptake (Beyers and Terblanche, 1971; Fisher and Walker, 1955 and Ford et al., 1965).

The curvilinear response of leaf Mg to spray concentration (Table 2), demonstrated that increasing Mg So_4 in the spray above 1% was not substantially effective in augmenting the Mg content of the

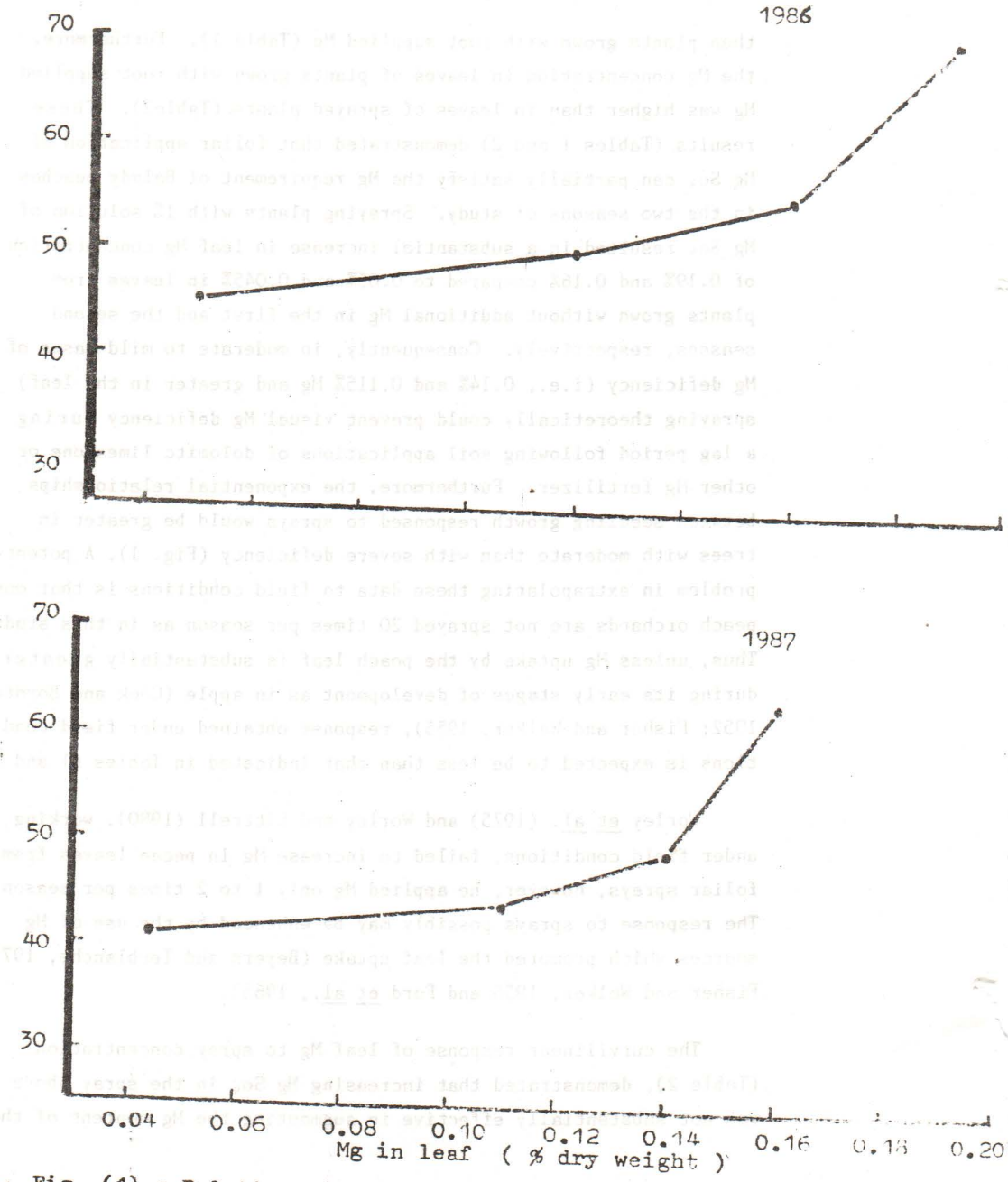

Fig. (1) : Relationship of Balady peach seedling growth to Mg in the leaf following foliar sprays of $MgSo_4$.

leaf. However, a small increase in leaf Mg from additional Mg SO_4 in the spray could result in a substantial increase in growth response. This increase can be inferred from the exponential relationship of growth to leaf Mg concentration (Fig. 1). It is also obvious that the treatments had a pronounced effect on the elemental concentration of the leaf (Table 2). Compared to root supplied Mg, omitting Mg increased the leaf concentration of P, K, Cu, and Zn, decreased Ca and Mg, and had no effect on N, Fe, Mn, B and Al. According to obtained data in Table (2), it is clear that Magnesium sprays, compared to no Mg application, affected all the above mentioned determined elements except Fe. The effect of foliar applied Mg on N, P, Ca, Cu, and Al was limited to lower concentrations of leaf Mg, whereas the effects on K, Mg, Mn, B, Zn, and Na were evident over the range of the foliar spray concentration. As the spray concentration of Mg So_4 was increased, the nutritional status of the plant approached that obtained by root supplied Mg. Consequently, application of foliar sprays of Mg So_4 to Mg deficiency peach tree is expected to alleviate nutrient imbalances induced by Mg deficiency as such.

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