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EFFECT OF MICRONUTREIENTS ON GROWTH AND FRUIT YIELD OF GRAPE CULTIVAR FLAME SEEDLESS

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ABSTRACT

An field experiment was carried out to evaluate the synergistic effect of micronutrients alone and in combination on growth and fruit yield in grapes during 2012. Grape cultivar "Flame seedless vines, grown at NARC, Islamabad, were sprayed at bloom and fruit set (just after berry shatter) with Zink @ 0.03%, Manganese @ 0.05%, Ferrous Sulphate @ 0.07%. Boric acid was used as 0.1% as wetting agent. For each treatment, micronutrients were sprayed twice with the first at bloom (just after berry shelter) and second spray a week later at fruit setting. Water was sprayed to serve as a control. After the fruits were fully mature, five clusters were randomly harvested from each vine to determine the cluster and berry weight , number of berries per cluster, berry length and width, fruit weight and fruit extract was measured using hand refractometer. cluster and berry weight of sprayed vines increased significantly over the non-sprayed vines and the largest cluster weight depicted as fruit yield per vine (10.56 kg) was obtained in this treatment where all the micronutrients were applied combined. Maximum berry weight, width, length and TSS i.e. 2.86g, 1.91mm, 1.82mm and 19.22% respectively, were recorded in this Treatment. Statistical differences were recorded for cluster weight, berry weight, berry width, length and TSS with Zn, Mn, Fe treatments. Micronutrients spray on the flame seedless grape cultivar may be recommended for obtaining higher yield.

Key Words: Micronutrients, Spray, Grape, Flame seedless, Berry yield and T.S.S

INRODUCTION

Grape (*Vitis vinifera* L) is one of the earliest domesticated and widely grown fruit crop in the world which can be eaten raw and also used for making juice, jam and rasins. In Pakistan grape is one of the earliest fruits grown by man. In Pakistan, grape is an important being one of the cash crops. In 2009-2010, total area under grapes was 15300 ha with total production 64700t and national yield of 4.2 t/ha (Government of Pakistan, 2009-10). The great benefits of spraying micronutrients such as Zn, Fe, Mn and B was used as wetting agent as antioxidant on improving growth and productivity of different grapevines cultivars, have been disused by several authors. Wosteoves and Jimkamas (2009) indicated that spraying micronutrients such as Zn, Fe and Mn were effective in improving growth of Thompson seedless grapevines. Foliar application of iron, zinc, iron +zinc and time of application have significant effect on flower, yield and essential oil percentage. The highest yield mean flower was obtained by the foliar application of Fe + zinc 46.4%. A similar effect off Zn supply per meter was also recorded on Matriccaria, Chamomilla (Grejtovsky *et al*., 2006), *S. Farinacea* (Nahed and Balbara, 2007). Zinc is one of the essential trace elements which is necessary for normal healthy growth and reproduction of crop plants. The positive effect of Fe and Zn on plant may be due to their effect as a metal component on same enzymes or regulatory for others essential role in plant metabolism (Abd El Hady. 2007). Regarding berry set, data showed that different boric acid sprays significantly increased fruit set as compared with injured vines control for both seasons. Sprayed four times has highest berry set. The average of berry set for both seasons were increased more than control by 48.9, 34.2, and 21.2 and 9.5 %. The favorable effect of Boron on growth characters and berry set could mainly attributed to its important role in metabolites of nitrogen, biosynthesis, translocation of carbohydrates and fruiting process. (Sprayed four times have the greater impact on increase of berry size, berry weight, berry dimension and yield of crop.. Exposing the clusters to direct sunlight through canopy management had some effective improvement on the fruit quality whereas number of bunches and yield. Janaki *et al*. (2004) conducted an experiment with grape cv. Muscat at Mathapatti (Coimbatore). They found that combined application of 2.0 kg B plus 0.2 %, foliar spray registered a maximum yield of 24.6 t / ha in winter and 26.15 t per ha in summer season. This application also helped to increase the brix and total sugar of berries and reducing acidity. Moreover in recent years, growers have also experienced with micro-nutrients such as Zn, Mn, Fe and Boron (B) to improve fruit-set ad increase fertilization of seeds, hence improving cluster fullness and increasing berry size. A study in California by Christensen *et al*. (2006) found that Boron was effective on vines when sprayed on foliage in either spring (pre-bloom) or fall (post-harvest) (Korkutal *et al*., 2008).

It support branching after fallen grape grains after inadequate granulation and they take part in fruit efficiency. In Pakistan, different researchers analyzed micronutrients status in different areas of the country. More than 60% soil samples were deficient in Zn (Chaudhry *et al*., 2007). There is little problem with Cu and Mn in alkaline soils of Pakistan. Soils of Sindh, Baluchistan and Azad Jammu and Kashmir areas were also tested and were found deficient in micronutrients (Anon., 2002). The above findings clearly indicate that the use of micronutrients is beneficial for enhancing yield and quality. Essential oil of *Mentha piperita* increased by 28.2% by foliar application of 3 ppm zinc chloride foliar application compared with the control Akhtar *et al.* (2009) .The main objective of the present study was to check the effect of micronutrients on grape cv. Seedless, which is being popularized in humid and rainy climate of Islamabad due to early ripening before the onset of rains.

MATERIALS AND METHODS

This investigation was performed during 2012 to examine the response of table grapes cv. Seedless, to foliar micronutrients spray on twenty years old grape vineyard at NARC. Grape vines were planted at row to row and plant to plant at 3 x 1.5m. The plants were grown on a single wire trellis system at experimental vineyard. The experiment designed as randomized complete block design, in triplicate fashion, each replicate having 3 vines. The numbers of clusters / vine were not adjusted but the average 24 clusters / vine were adjusted. The spray material was applied in full coverage with hand sprayer. Different concentrations of micronutrients, Zn: 0.03%, Mn: 0.05%, Fe: 0.07% and 0.1% B was used as wetting agent were applied in 2012 in two splits. The first spray was applied at 70-80% bloom (on 4th April) followed by second spray after the post bloom treatments, were applied just after fruit setting (on 9th May) in both the experimental seasons. Three vines were selected for each treatment. After the fruits were fully mature, three clusters were randomly harvested from each vine to determine the cluster fruit weight, berry weight, 100 berry weight, berry width, berry length and total soluble salts (determined by hand refrectrometer). The data obtained was analyzed statistically by computer using Statistics soft ware and the differences among the treatments means were compared by the least significant differences (LSD) test at 5% probability level. (Steel and Torrie, 1997). All data presented here is on the basis of fresh weight.

RESULTS AND DISSCUSSION

Results regarding all seven characteristics showed significant difference among the treatments (Table 1). Spraying perlet grapevines with a mixture of micronutrients or alone, containing Zn, Mn, and Fe in sulphate form at concentration of 0.03%, 0.05%, 0.07% and Boron, stimulated growth parameters namely number of clusters, number of berries / cluster, average berry weight, 100 berry weight and fruit yield . The largest cluster numbers resulted when the plants were sprayed with multi-micronutrients (T5) as compared with control. The promotion was associated with increasing micronutrients although; the individual micronutrients had a slight promotion on the growth and yield than did multi-micronutrients treatment. The untreated vines had the minimum vegetative values and yield parameters / vine. The effect of micronutrients, Zn, Fe and Mn in enhancing the formation and transportation of Indoor acetic acid as well as stimulating cell division ad the biosynthesis of carbohydrates could enhance the growth and fruit yield. The positive effect of micronutrients on the studied vegetative and fruit yield are in agreement with those of Abada (2002), Janaki *et al*. (2002), Zehtab-Salmasi *et al*. (2008).

Data regarding on cluster numbers, the vines treated with the mixture containg Zn, Fe and Mn in sulphate form improved cluster numbers of grape cv. Flame seedless. Increasing the prementioned micronutrients in the spray solution resulted in more pronounced effect concerning cluster number, cluster weight and berry weight. The maximum value of cluster number was presented when the grape vines were sprayed with mixture of micronutrients (T_5) Table (1). Moreover, the results presented in Table (1) showed that the cluster numbers were significantly improved in all treatments compared with control. The promotion on the cluster number was in proportional to the increase in micronutrients concentrations. No significant difference could be deducted using different micronutrients at Zink @ 0.03%, Manganese @ 0.05%, Ferrous Sulphate @ 0.07% in this respect. These results may be explained in the light of positive response of micronutrients on berry weight as well cell division and biosynthesis of organic foods (Wassel *et al*., 2007).

The present results are in agreement with those of Christensen *et al*. (2006) and Singh *et al*. (2002) on seedless grapes. Results in Tables 1 showed the increasing trend of the studied parameters - cluster number, cluster weight, berry weight and fruit yield / vine. The important role of is in enhancing berry weight and dimensions and also stimulating cell elongation might be explain present. The positive effects of multi-micronutrients on cluster weight, berry weight, yield / vine are in accordance with those of Joller *et al*. (2006) and Ahmed *et al*. (2005).

Table 1. Effect of micronutrients on growth and fruit yield of grape cultivar flame seedless.

Treatments	Cluster number	Cluster weight (g)	Berries per cluster	Average Berry weight (g)
T1, Control	17.330 d	222.72 e	71.23 d	1.6200 b
T2, Zinc 0.03%	24.000 c	234.55 d	86.33 c	1.7200 b
T3, Mn 0.05%	22.180 c	259.40 c	90.04 c	2.1700 ab
T4, Fe 0.07%	33.520 b	267.32 b	99.38 b	2.3500 ab
T5, T2, T3, T4	37.660 a	280.30 a	108.66 a	2.8300 a
LSD 0.05%	4.036	5.804	5.514	0.832

Treatments	Berry Length (cm)	Berry width (cm)	Fruit Yield kg/plant	TSS %
T1 Control	1.5800 d	1.4833 c	3.86 c	16.250 c
T2 Zinc 0.03%	1.6600 c	1.5600 c	5.63 bc	17.820 b
T3 Mn 0.05%	1.7000 c	1.6833 b	5.75 bc	18.070 b
T4 Fe 0.07%	1.7600 b	1.7600 ab	8.96 b	18.300 ab
T5, T2, T3, T4	1.8400 a	1.8100 a	10.56 a	19.240 a
LSD 0.05%	0.051	0.103	221.18	1.149

Effect of micronutrients on the chemical properties of Flame seedless grape berries

Mixture containing micronutrients (Zn, Mn and Fe) at 0.03%, 0.05% and 0.07% sprayed on Flame seedless grape vines resulted in positive promotion on chemical quality expressed as total soluble salts and total soluble solids acid ratio, simultaneously decreased acidity in the juice (Tables 1). The results also indicated that individual micronutrients did not show significant stimulating effect on chemical fruit quality. The control treatments showed that berries were found in higher acidity and lower total soluble salts. The results of present study concerning the effect of micronutrients on chemical properties of the berries are in line with those of Attia (1998) and Mostafa *et al.* (2006).

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