

/ / /
 /
 / (30 20 10)
 (Hapil) (%17 H3BO3)
 . (Kaiser's samling)
 .2007/5/1 2006/11/ 30
 / 1 (Asdazim 50wp)
 75 25 2,25
 (RCBD) 25
 .%5 9
)
 ()
) / 20
 (/ 5 ,92 109 ,01 10 ,10 %56 ,73 115 ,20)
 / 30
 .(%15 ,40 31 ,50) (TSS) total soluble solids

The Iraqi Journal of Agricultural Sciences 41 (3):89-99,2010 Dawood at el

EFFECT OF FOLIAR APPLICATION OF BORON ON GROWTH, FLOWERING AND YIELD OF STRAWBERRY

Zuhair A. Dawood Ayad H. Al-Alaf Ragheed H. Al-Sultan
Hort. Dept., College of Agric. and Forestry, Mosul Univ., Iraq.

ABSTRACT

This research was conducted in Strawberry field at Horticulture Department, College of Agriculture and Forestry, Mosul University, during 2006-2007 season to study the effect of foliar application of four concentration of Boron (0, 10, 20 and 30 mg/L) using Boric acid (17% Boron) on vegetative growth flowering and yield of two Strawberry (*Fragaria×ananassa* Duch.) cultivars (Hapil and Kaiser's samling). All treatments applied till dew point by using little amount of liquid soap as surfactant, each concentration of Boron sprayed twice, the first one at 30/11/2006 and the second date was at 1/5/2007. The field of experiment divided to three blocks, plants were treated with a systematic fungicides (Asdazim 50wp) at range (1 mg/L). Transplant planted lines to the east direction, length of each furrowed was 2.25m, with 25cm in a high the distance between two liens was 75cm and the distance between plants was 25cm. A randomized complete block design with three replicates and each experimental consist of nine plants used and a Duncan multiple range test at 5% to compose. Result obtained indicated that, leaf area, percentage of flower set, fruit weight, plant yield and total yield were significantly increased in Hapil cultivar as compare with those in Kaiser's samling cultivar. At the same time, the highest increases in leaf area, percentage of flower set and average weight of fruit recorded by foliar application of 20 mg/L of Boron, but the highest yield per plant and total yield obtained by application 0 mg/L Boron on Hapil cultivars plants. While application of 30 mg/L of Boron on Kaiser's samling plants gave the best result in percentage of leaf dry weight and total soluble solids in fruits.

(2)

(Fragrant Fragrance)

(1) Chilliak

Strawberry

(8)

(42 36) (IAA)

Rosaceae

Rosales

Rosaideae

Fragaria×*ananassa*

Fragaria

4 13)

(63)

(23) Duch

(9

,666 ,464)2005

(257 ,127)

(3

.(21)

.(41 3 12)

(Quinault)

31

(1 ,25 0 ,25 0 ,05 0 ,01)

/

C

(40)

30

.

(Earliglow)

(PH 5,5)

(5)

.(PH 6,5)

)

27

(

/ 1.7

(Allstar)

(10)

Ca 0 ,5 B)

26

20/ 15

(% 5 ,5

17

(% 0 ,2 0 ,1 0 ,05 0,0)

2007/9/15 seedless

(TSS)

35

(Asdazim 50wp) / B 160

(10-5)

(15) / 1 (Elsanta)

20×15 ()

(TSS)

%20 Abamectin (Vertimic) / B 160

(15) /Ca 1,5 CaCl2

%18 (Touch down) 16 (TSS)

(% 0 ,4 0 ,2) (H3BO3)

20/ 150 Bing)

(15) (Blacktorarian

³ 1 ,2 ² 50 . %60

³ 12 ()

11

25 2 ,25

/ /

2007-2006

25

2006/10/30

%2 ,49

2 ,81 7 ,4 pH

%0 ,063 /

1 ,2 (18:18:18) NPK 244 ppm 75 ,5

/meg

Kaiser's) (Hapil)

(30 20 10) (samling

H3BO3) /
 : (%17
 (Hapil) (1) 2006/11/30
 (Kiasers samling) . 2007/5/1
 f^2 68.67 93.30 (RCBD)
 . 9
 : .
 : -1
 37 (f^2)
 .(22 32)
 () 11 14 6
 ()
 /B 20 10
 30
 /B $\frac{\quad \times \quad}{\quad} =$
 10
 /B ()
 63 ,00 /
 / : -2
 %
 () : -3
 ()
 / 20 / / ()
 2 115.20 (%TSS) -4
 .
 .
 :
 (RCBD)
 (SAS)
 . (7) % 5
 (42 18)

	56,73				
30		24	20	33	
	. 15,40	/B			
34					
		(2)	:	(TSS)	
29					
		(32	51.70)		
. <i>Vitex angus</i>	(Lily)				
(TSS) total soluble solids			/		
				T.SS	
(28)		14	8		
			38		
	.(39)				
		(TSS)	total soluble solids		
:				43	
(Hapil)	(3)		Selva	Dimant	Aramas
(Kiasers samling)					
)		(2)			
(		/			
		(	24.9)		
	(2)				
14	6	(T.SS)	total soluble solids		
		/B	30		
19				(15.25)	
	29,30				
		/	20		

25

(Vaccinium corymbosum L.)Blueberry

/ 30

)

(

. 1

					/	
		()	/	f²		
f²		24 ,50	46 ,00	- 88 ,50		Hapil
93 ,30		30 ,00	67 ,00	104 ,70	10	
68 ,67						
/		29 ,50	46 ,50	115 ,20	20	
38 ,00		29 ,50	42 ,50	64 ,80	30	
50 ,25		28 ,00	59 ,00	- 68 ,50		Kaiser's samling
()		30 ,50	59 ,00	- 78 ,75	10	
		27 ,50	41 ,00	- 71 ,95	20	
28 ,37		31 ,50	52 ,00	55 ,50	30	
29 ,37						
		/				
		26 ,25	42 ,50	78 ,50		
		30 ,25	63 ,00	91 ,73	10	
		28 ,50	38 ,75	93 ,58	20	
		30 ,50	42 ,52	60 ,15	30	

*

%5

(TSS)

.2

		% TSS			/	
		(TSS) %	%	/		
/		13 ,85	– 48 ,56	20 ,50		Hapil
20 ,25		12 ,50	- 47 ,01	18 ,25	10	
23 ,13						
		14 ,35	56 ,73	19 ,20	20	
51 ,70		15 ,10	54 ,50	– 23 ,05	30	
32 ,00		13 ,60	35 ,00	29 ,30		Kaiser's samling
% TSS		13 ,65	32 ,00	16 ,90	10	
13 ,95		13 ,55	29 ,50	26 ,35	20	
14 ,05		15 ,40	31 ,50	20 ,00	30	
		/				
		13 ,72	41 ,78	24 ,90		
		13 ,08	39 ,51	17 ,57	10	
		13 ,95	43 ,12	22 ,77	20	
		15 ,25	43 ,00	21 ,52	30	

*

%5

. 3

		/	/	()	/		
/		5 ,71	98 ,31	9 ,93	9 ,90		Hapil
10 ,18		3 ,92	73 ,94	9 ,36	7 ,90	10	
7 ,70							
()		5 ,92	109 ,01	10 ,10	10 ,80	20	
9 ,49		5 ,29	98 ,87	8 ,68	12 ,15	30	
5 ,45		1 ,99	46 ,66	4 ,62	10 ,10		Kaiser’s samling
/		3 ,12	58 ,66	9 ,21	6 ,90	10	
97 ,30		1 ,69	46 ,50	6 ,04	7 ,70	20	
39 ,16		1 ,66	36 ,11	5 ,92	6 ,10	30	
/		/					
5 ,21		3 ,96	73 ,74	6 ,78	10 ,00		
2 ,12		3 ,53	66 ,02	9 ,29	7 ,40	10	
		3 ,70	68 ,54	7 ,03	9 ,25	20	
		3 ,48	64 ,62	6 ,81	9 ,13	30	

*

%5

-3

Solanum

.2004 .

. 2002 .

-1

tuberosum L)

- (451)

. 20-8 :(2)7 .

-

.2003 .

-4

.1996 .

-2

. 482

. 344

- Fragaria* × *ananassa* . 2000 . -5
- . Duch
- . 81
- . 2007 . -6
- .1993 . -15
- /
- .(Fragaria x ananassa Duch)
-
- .2007 . -16 . 75
- . 1990 . -7
- .89
- /
- 17- Ali, H.A. 2000. Response of flame seedless Grapevine to spraying with Ascorbic acid and Boron. Minia . J. of Agric .Res & Develop 20(1) : 159-174. . 2000 . -8
- 18- Andriano,D.C. 1985. Trace element in the terrestrial environment Springer . Newyork.560 . 2006 . -9
- 19- Dangaard, H. and H. Lindhard. 2000. Strawberry cultivars of organic production . Gartenbau Wissenschaft , 65(5): 213-217. . 66 . 2004 . -10
- 20- El-Salhy, A.M. 2001. Effect of foliar application of Boron and some growth regulators spraying on growth and fruiting of Roomy Red Grapevines. The Fifth Arabian Horticulture Conference, Ismailia, Egypt, 12(1) :24-28. () . 8-1: (5)16 . 2008 . -11
- 21- FAO. 2007 .FAOSTAT Agricultural statistics database <http://www.FAO.org>
- 22-Gaafar, R.M., and M.M. Saker. 2006.Monitoring of cultivars identity and genetic stability in Strawberry varieties grown in Egypt. Word Jour of Agricultural Sciences 2(1):29-36. . *Fragaria* × *ananassa* Duch
- 23-Garden strawberry .2007 . From wikipedia, the free encyclopedia. . 1988 . -12
- 24- Gibson, J. L. ; P. V. Nelson ; D. S. Pitchay and B. E. Whipker .2001. Identifying nutrientdeficiencies of Bedding plants. NC. State university floriculture research . Florex , 004 :1-4. . 1994 . -13
- (*Vicia faba* L.)
- .25-20 : (1) 12 .
- . 2008 . -14
- 25- Hanson, J. E. 2001. Foliar boron sprays do not affect Highbush Blueberry productivity.Journal of Small Fruit & Viticulture , 1(1) : 35-41.

- 35- Pawel, W. and L. Mariusz .2003. Effect of Calcium and Boron sprays on yield and quality of Elsanta Strawberry . Journal of Plant Nutrition , 26(3) : 671-682.
- 36- Rainham, D. 2001. Post harvest nutrition for pome fruit Horticultural . News letter G.P.Dall Horticultural Consultant. vol. 7(4).
- 37- Saieed, N.T .1990. Studies of variation in primary productivity and morphology in relation to elective improvement of broad-leaved tree pecies. Ph.D.Thesis.National Univ. Ireland.
- 38- Skupien, K. and J. Oszmianski .2004. Comparison of six cultivars of Strawberry (*Fragaria× ananassa* Duch) grown in northwest Poland. Eur Food Res Technol 219(1):66-70.
- 39- Sutcliffe, J. F and D.A. Baker .1981. Plants and mineral salts. Studies in Biology No. 48.Edward Arnolds Publishers) Ltd. London.
- 40- USDA. 2006 . National Nutrient database for standard
- 41- William, L.P. 2005. Drip irrigation can effectively apply Boron to san Joaquin valley vineyards. California Agriculture , 59(3) : 188-191.
- 42- Wojcik, P. And M. Wojcik .2006. Effect of Boron fertilization on Sweet Cherry tree yield and fruit quality .Journal of plant nutrient 29(10): 13-20.
- 43-Zaldivar, C.P., S.E. Ebeler, and A.A.Kader .2005 . Cultivar and harvest date effects on flavor and other quality attributes of California strawberry. Journal of Food Quality 28(2):78-97.
- 26- Heng, V. 1999. Effect of foliar Calcium and Boron application on fruit cracking of Cherry and fresh market Tomatoes. Asian Regional Center 4(2): 1-7.
- 27- Julia, W. and W. Roberts . 1994. Fall fertilization of Strawberry with Boron. Amer. Soc. For. Hort. Sci .29(1) : 726-735.
- 28- Kumar, S. and S. Bhushan. 1978. Effect of applying zinc, manganese and boron to the vines of cultivar Thompson seedlings on their vigour, yield and nutrient status. J. of Res. Punjab Agric. Univ.15(1)43:48
- 29- Marshchner, H. 1986. Function and mineral nutrients Micronutrients Boron in mineral nutrition of higher plants . London pp 312-334.
- 30- May, G.M. 1993. Phosphorus, Zinc and Boron influence yield components in Earliglow Strawberry. J.Amer. Soc. For . Hort .Sci , 118(1): 43-49.
- 31- Neilson, B.V. and G.W. Eaton .1983. Effect of Boron nutrition upon Strawberry yield components. HortScience , 18(6) : 932-934.
- 32- Nielsen, J.A. and P. H. Lovell.2000. Value of morphological characters for cultivar identification in strawberry(*Fragaria× ananassa* Duch) New Zealand Journal of Crop and HortSci. 28(3): 89-96.
- 33- Omar, A.K. 1999. Response of Roomy Red Grapevines (*Vitis vinifera* L.) to some antioxidant and biofertilizer treatment. M. Sc. Thesis .Fac. Agric. Minia Univ.
- 34- Patrick, H.B. and H. Hening .1998. Boron mobility and consequent management in different Crops. Better Crops 82(2):28-31.